DOCUMENT RESUME

ED 037 198 JC 700 052

AUTHOR	Johnson, Stuart; Johnson, Rita
TITLE	[An Instructional Reorganization Series.]
INSTITUTION	Regional Education Lab. for the Carolinas and Virginia, Rougemont, N.C.
PUB DATE	Nov 69
NOTE	113p.
EDRS PRICE	EDRS Price MF-$0.50 HC-$5.75
DESCRIPTORS	Autoinstructional Aids, *Behavioral Objectives, Course Objectives, *Educational Strategies, Effective Teaching, Evaluation, Evaluation Criteria, Instructional Design, *Instructional Improvement, Instructional Materials, *Junior Colleges, Measurement Techniques, Performance Criteria, *Systems Approach, Teaching Procedures

ABSTRACT

This series of self-instructional booklets is designed to assist teachers in improving their instructional effectiveness by (1) breaking course activities into short segments, enabling each learner to proceed at his own pace; (2) monitoring learner achievement after completion of each segment of the course; and (3) revising each instructional segment until the desired level of achievement is attained by the learner. Specific procedures are provided to assist teachers in producing a short, self-instructional package for one of their courses, including objectives, instructional activities, and evaluation measures. Although intended for use in developing a self-instructional package, the booklets are also appropriate for use in improving lecture-format instruction. (Author/MC)

ED037198

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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[AN INSTRUCTIONAL REORGANIZATION SERIES]

BY

STUART JOHNSON AND RITA JOHNSON

UNIVERSITY OF CALIF.
LOS ANGELES

FEB 26 1970

ERIC CLEARINGHOUSE
FOR JUNIOR COLLEGES

Junior and Community College Division

Regional Education Laboratory for the
Carolinas and Virginia

JC 700 052

ED037198

INTRODUCTION

to

INSTRUCTIONAL REORGANIZATION SERIES:

Booklet I - Specifying and Analyzing Objectives
Booklet II - Measuring Attainment of Objectives
Booklet III - Arranging Instructional Activities
Booklet IV - Selecting and Designing Methods and Materials
Booklet V - Refining the Instructional System

by

Stuart Johnson and Rita Johnson

To be available in November 1969
published by:

Regional Educational Laboratory
for the Carolinas & Virginia
Mutual Plaza
Durham, North Carolina 27701

INTRODUCTION TO INSTRUCTIONAL REORGANIZATION SERIES

by

Stuart Johnson and Rita Johnson

Purpose of the Series

The overall purpose of this series is to assist teachers to improve the effectiveness of their instruction. The procedure advocated consists of:

1) breaking course activities into short segments through which learners can proceed at their own pace,

2) monitoring achievement of learners after completion of each segment of the course and,

3) revising each instructional segment until the desired level of achievement is attained by the learners.

An immediate aim of this series is that you, the reader, after working through these self-instructional booklets, will be able to produce a short "instructional package" which will be used with one of your classes and revised until it is effective. The package should be self-instructional as far as possible to permit your learners to proceed at their own pace.

Specific procedures will be provided as you complete each booklet to assist you in producing the three essential components of your package: 1) objectives, 2) instructional activities, and 3) evaluation measures.

Self-Instructional Materials

Teachers are potentially the most sensitive, flexible, and divergently responsive components of any instructional system. Under the limitations of conventional teaching, however, they seldom have the time nor opportunity to concentrate their efforts on that which teachers can do best: 1) diagnose individual learner's difficulties, 2) interact with learners when they need help on a one-to-one basis or in small group discussions, 3) inspire and motivate, or 4) identify and encourage creativity and self-direction. Self-instructional packages are essential if we wish to free teachers and learners for this type of individualized instruction. However, for those who yet wish to capitalize on the advantages of a lecture method, it should be noted that the booklets are quite appropriate for use in improving lecture-format instruction as well.

Instructional Objectives

Some users of these booklets have already developed skill in writing objectives so that another teacher can read them and tell what the learners are to be able to do by the end of instruction.

In the event that you are uncertain as to how to write objectives in this way, please take time at this point to read and work through:

Preparing Instructional Objectives
by Robert Mager (Fearon Publishers).

If Mager is not available you could use:

Educational Objectives
by W. James Popham (VIMCET Tape and Filmstrip, #1, UCLA).

Please remember that these instructional materials have been prepared for a general audience and you may have to apply their procedures to the special problems of your own teaching area. When you have finished Mager (or Popham) please return to this booklet and continue on the following page.

* *

Now that you have practiced writing instructional objectives, you may feel that this approach is suitable only for trivial recall objectives. This impression has been called the "tragic flaw" in both Mager and Popham's material. They selected simple objectives for the purpose of instructional simplicity. However:

> Instructional objectives can and should be made as complex and subtle as you are capable of producing! Your objectives may be primarily in the area of student intellectual growth; or your objectives may describe desired student attitudes. In any case, they must be explicit.

Use of the Booklets

A few guideline observations are in order as you begin the booklets:

1. Progress in working through the booklets and producing your material will be facilitated if you work with a team, i.e., one or more of your colleagues. You should use your team members as resource persons to critique your objectives, test items, or instructional activities, and to allay (or confirm) any misgivings which arise.

2. As you work through each booklet, write in the answers to each practice exercise. These booklets are yours; annotate them for later reference.

3. After completing each of the booklets, refer to the procedure sheet on the next page. It is designed to guide your step-by-step production of a self-instructional package.

PROCEDURES FOR PRODUCING A SELF-INSTRUCTIONAL PACKAGE

After reading each of the booklets, do the following:

1. Book I - Write a set of objectives, including one in the affective domain.
2. Book II - Write your post-test.
3. Book III - Write an outline of a script for a sequence of instruction which provides the learner with the following:
    small steps
    prompts
    practice
    knowledge of results
4. Book IV - Prepare materials with sufficient directions so that learner can work through package without additional help from you!
5. Book V - Administer the package to a few learners. If objectives are not achieved, revise package. Talking with learners will help locate inadequacies in the package.

    Notes should be kept regarding development of the package and the history of its tryout, including student comments or other reasons for revisions.

You are now ready to proceed to the first booklet. Good luck!

BOOKLET I

SPECIFYING AND ANALYZING OBJECTIVES

Stuart R. Johnson

RELCV Working Paper

RELCV, a private non-profit corporation, is a regional education laboratory funded primarily by the United States Office of Education under provisions of Title IV of the Elementary and Secondary Education Act of 1965. The opinions expressed in this paper do not necessarily reflect the position or policy of the Office of Education, and no official endorsement by the Office of Education should be inferred.

REGIONAL EDUCATION LABORATORY FOR THE CAROLINAS AND VIRGINIA
Mutual Plaza, Durham, North Carolina 27701

PREFACE

This series of self-instructional booklets represents the fifth version of an original series developed early in 1968 by a team interested in fostering a systems approach to instruction. The team included:

Bruce Monroe	Instructional Systems Group Seal Beach, California
Larry Harty	Instructional Systems Group Seal Beach, California
Frank Gorow	California State College at Long Beach Long Beach, California
John Nance	Fullerton Junior College Fullerton, California
Rita Johnson	California State College at Los Angeles Los Angeles, California
Stuart Johnson	Junior College Leadership Program University of California at Los Angeles

The current authors have used these booklets with four groups of junior college faculty members (n=80,12,24,55). After each tryout the series was revised, based mainly on error-rate and interview data as recommended by Edling (pp. 177-194, Rev. Ed. Res., Apr. '68). With regard to the last two versions, it would appear that 90% of the participants achieved at the 80% level for all booklets. Whether this achievement level results in changed classroom practice remains to be demonstrated during follow-up visits to institutions in 1969 and 1970. If faculty use of these booklets does not result in demonstrable junior college student achievement, the booklets will not have met their purpose (and will be revised).

Dr. Rita Johnson

RELCV

Dr. Stuart Johnson

RELCV

SPECIFYING AND ANALYZING OBJECTIVES

Stuart R. Johnson

One often hears teachers say (wistfully) "I'd like my students to learn to think critically and with some originality." Although a degree of consensus can sometimes be obtained as to what constitutes critical thinking or originality, teachers usually admit that they are uncertain about how to produce such learning. Should a teacher begin by teaching definitions and terms basic to a field and then proceed to concepts and applications? Should a teacher begin by posing a problem, then filling in terms and concepts as they are needed? Should one teach chronologically? Inductively? Deductively?

It is clear that any answers to these questions will require attention to more fundamental questions. What are the different kinds of tasks in which the teacher wants his students to develop proficiency? What prerequisite tasks are involved and how should the learning activities be sequenced?

The purposes of this booklet are:

1. To develop in you the ability to apply rigorous criteria in determining the desired aims of instruction, and,
2. To assist you in analyzing the learning tasks which underlie a desired instructional outcome.

The exercises in this booklet have been prepared with several assumptions in mind:

1. The reader has accepted the importance of developing objectives as a beginning point in instructional planning.

2. Instructional objectives should be stated in terms of what new things the students can do as the result of instruction.

3. The reader is applying what is learned from these pages to the development of a specific instructional plan, and decisions made in one stage of planning will be modified by decisions based upon later considerations.

You have, of course, mastered the essentials of the subject matter or skills which you teach. However, you may not have thoroughly analyzed or classified the kinds of learning tasks involved. Presumably you are interested in developing and implementing an "instructional system" for a particular group of learners with known (or assumed) beginning competencies. The comments which follow will appear more pertinent if you can refer to your own first draft of objectives for a proposed instructional plan.

The objectives making up this first draft will probably need to be broken down into more specific descriptions of learner behavior. You should also employ some scheme designed to assure that all the learner behavior being sought has been included. Finally, given an initial set of objectives, you must be sure that relevant prerequisite skills are taken into account in your instructional plan.

Two forms of logical analysis will be used:

Analysis by Type of Behavior means determining where a given objective fits with respect to the major categories of learning outcomes, that is, psychomotor ("skills"), affective ("attitudes"), and cognitive ("knowledge").

Task Analysis means breaking down a complex learning task into successively simpler sub-tasks, each of which is necessary for the final accomplishment of the complex task.

THREE MAJOR TYPES OF EDUCATIONAL OBJECTIVES

All educational objectives can be classified as primarily in one of three "domains" or large categories: psychomotor, affective, or cognitive. An example of a psychomotor learning objective is sinking baskets with a basketball; the objective involves controlling the muscles and making the proper motions so the ball will regularly go through the hoop. Objectives in the affective domain involve feelings and attitudes. An example would be the learner's attitude toward a subject following the first day's introduction by the instructor. The objective would be a favorable feeling toward the subject or a desire to learn more about the subject and the benefits that can be derived by mastering the subject. Cognitive learning objectives involve intellectual processes including remembering, understanding, problem-solving, and other kinds of learning which involve information storage, retrieval and processing.

Most instruction includes some learning in all three of the domains. Often, the cognitive aspects are most emphasized but cognitive learning will also depend upon affective learning and psychomotor skills. For example, the student who has never learned to pay attention or "attend" (affective behavior) to a lecture may have very little information to process and store (cognitive) from an hour of listening to instruction, particularly if his penmanship (psychomotor) is so erratic that he cannot review his notes.

Each of the following five statements shows instructional concern about behavior classified primarily as psychomotor, affective, or cognitive. Label each statement with one of these three terms in the space to the right:

1. The student's interest is an important factor for success in my class.
2. In reading a micrometer, the student must get the proper "feel" as he turns the knob.
3. The important thing is to understand what you read, not to just remember what was in the chapter.
4. Tighten the nut until it is "finger tight."
5. Before you start the job, think through the steps in the procedure.

Answers should read:
1. Affective
2. Psychomotor
3. Cognitive
4. Psychomotor
5. Cognitive

If you had difficulty with the classifications, please review the paragraph which describes the three categories of learning objectives. You might also wish to look over the fuller descriptions of each classification in the appendices.

You have now taken a first step in the analysis of type of learner behavior; classifying examples into one of the three large domains or categories. Various specialists also have attempted to analyze educational objectives within each of the three domains.

A CLASSIFICATION OF PSYCHOMOTOR OBJECTIVES

The performance of responses requiring muscular coordination (the psychomotor category) has been analyzed by Elizabeth Simpson. Her classification is abstracted below and is presented in greater detail in Appendix A. She proposes that the five categories are arranged according to increasing complexity, and that the first step is necessary to the completion of the second and so on.

Below, decide which objective is more complex and place a check by the more complex objective:

1. Student shall grasp the tennis racquet handle as if he were shaking hands with it. ☐
2. When hitting the ball, student shall not let the racquet head drop below the handle. ☐

In the exercise above, holding the racquet properly is a necessary preliminary to hitting the ball with the racquet in proper position; therefore, the second objective is more complex.

Now please examine the psychomotor classification which follows:

THE PSYCHOMOTOR CLASSIFICATION

LEAST COMPLEX

- Perception - becoming aware of a situation which may result in a muscular response.
- Set - adjustment or readiness for a particular kind of action.
- Guided response - imitation of another person performing an act or trying various responses in trial-and-error fashion.
- Mechanism - an habitually correct response.
- Complex overt response - performing a complex act correctly with ease and without hesitation.

MOST COMPLEX

At what level of the PSYCHOMOTOR CLASSIFICATION is each of the objectives below?

1. Student shall grasp the tennis racquet handle as if he were shaking hands with it. ☐
2. When hitting the ball, student shall not let the racquet head drop below the handle. ☐

Objective #1 should have been labeled "Set" and Objective #2 labeled "Guided Response" or higher depending upon whether the student is beginning to gain this skill or is displaying the skill on a habitual basis. Objective #1 is considered to be the physical readiness necessary to hit the ball, and is therefore, placed in the "Set" category. If you need to develop more elaborate sets of psychomotor objectives, it is likely that Appendix A will be helpful since it contains more complete descriptions of each category.

A CLASSIFICATION OF AFFECTIVE OBJECTIVES

The affective category has been analyzed by a group of measurement experts. Their classification is presented in Appendix B and a modified version follows below. If you and your colleagues are to design an instructional system which leads to predictable achievement by learners, you should not ignore so important a consideration as the attitudes and feelings of the learner. It may be that something in the affective category will make the difference between failure and success on a particular cognitive objective. The affective classification is arranged so as to show increasing levels of personal acceptance.

THE AFFECTIVE CLASSIFICATION

LOW ACCEPTANCE

- Receiving or Attending - awareness (of form, color, differing viewpoints, importance of something), willingness to receive (as shown by hearing viewpoints of others or accepting differences), and controlled or selected attention (as shown by listening with discrimination or sensing importance of details)
- Responding - acquiescence or compliance, willingness to respond, and satisfaction in response (as shown by expressing pleasure)
- Valuing - acceptance of a value, preference for a value, and commitment or conviction (as shown by being loyal or attempting to influence others)
- Organizing - developing a value system (as shown by identifying the characteristics of something valued or by making plans concerning social problems)
- Characterization - developing an ethical code or a philosophy of life (as shown by consistent behavior)

HIGH ACCEPTANCE

This outline of affective terms arranges in sequence the feelings and the emotional responses which are usually labeled "interest," "attitudes," "appreciation," and "values." The range is from simple attention to the development of a value system. The two lower levels, "receiving or attending" and "responding," are basic to all successful instruction. The higher levels are concerned with personal and interpersonal adjustments, values formation and character development.

See if you can judge which two of the following objectives are lowest in terms of acceptance; place an "L" in the blanks. Then decide which two are highest in acceptance and place an "H" in the blanks:

1. Student reads newspaper editorial on freedom of speech when assigned as homework. ☐
2. Student defends a fellow-student's right to advocate governmental censorship of news. ☐
3. Student listens to what is said during class discussion on freedom of speech. ☐
4. During class discussion student describes the history and underlying assumptions in his advocacy of free speech. ☐

You should have placed an "L" by number 1 and 3; an "H" should appear by number 2 and 4. If your answers did not correspond, it may be helpful to review the affective classification in the appendix. By way of examples, the four objectives above are in the following categories:

1. Responding
2. Characterization
3. Receiving
4. Organization

It is obvious that affective objectives are important to instruction. For example, it is hard to imagine a successful instructional program which failed to capture the student's attention or failed to make him willing to respond. Furthermore, it is the writer's experience that most instructors care deeply about developing some sort of positive attitude among students toward the subject of instruction. Pure cognitive learning without expression in the real-life of the student is a futile exercise.

A CLASSIFICATION OF COGNITIVE OBJECTIVES

A practical classification of cognitive learning objectives was provided by the same group of testing experts who analyzed affective learning. It is arranged in terms of complexity. Its chief value to instruction is in helping to call the teacher's attention to more complex objectives than mere memorization and recall. The complete classification system has been summarized below from the original which is found in Appendix C. You should also review the original at some future time for examples and further explanation.

AN ABBREVIATED CLASSIFICATION OF COGNITIVE OBJECTIVES

LEAST COMPLEX

1.0 Knowledge or ability to recall information (memory)
    1.1 Knowledge of Specifics - facts, definitions, symbols
    1.2 Knowledge of Ways of Dealing with Specifics - of forms and conventions, steps in a process, categories, etc.
2.0 Comprehension or understanding
    2.1 Ability to translate or rephrase
    2.2 Interpretation, or recognizing essentials
    2.3 Extrapolation, or recognizing implications, limitations
3.0 Application or transfer - ability to use knowledge and understanding in a novel situation to solve problems

4.0 Analysis or breaking a whole into its elements, analysis of relationships or organizational principles

5.0 Synthesis or putting together elements and parts to form a new whole

MOST COMPLEX 6.0 Evaluation or making judgments in a field using internal evidence or external standards

Achieving competence at any given level in the cognitive classification is thought to require competence at successively lower levels. For example, to explain the meaning of a word by saying "in other words" (2.1) requires memory of the given definition (1.1).

Try classifying the following instructional objectives into one of the following levels: Knowledge, Comprehension, or Application. Write "K," "C," or "A" in the spaces provided:

1. To give the appropriate English equivalents of forms of greetings in French, but not exact translation. ☐
2. Given the names of three contemporary composers student shall give the name of one composition by each ☐
3. Student can explain in his own words the meaning of a political cartoon. ☐
4. Student shall convincingly represent a member of a tax-payers' association during a mock meeting of the city council. ☐

The intended answers are:

1. Comprehension
2. Knowledge
3. Comprehension
4. Application

We can best provide the conditions for learning when we understand the nature of the learner's tasks. These depend, in turn, upon the level of complexity of the objectives. If the learning task involves memory only, we can provide ways to help the student remember and provide practice sessions in remembering. If the learning task involves comprehension of an idea or the meaning of technical terms, something more than memory is involved, for memory alone will not help the learner to "explain in his own words." Students will need practice at rephrasing ideas or concepts in order to develop competence. Similarly students should be given practice at whatever cognitive level we seek competence.

SUMMARY OF ANALYSIS OF TYPE OF BEHAVIOR

You now have three frameworks for analyzing learner behavior. You have seen that all objectives can be classified primarily into one of three categories: psychomotor, affective, or cognitive. The affective domain has been divided into five classes: receiving or attending, responding, valuing, organizing, and characterizing behavior. The cognitive category has been subdivided into six classes: knowledge or memory, comprehension, application, analysis, synthesis, and evaluation; some of the classes have been subdivided further. A psychomotor classification scheme describes muscular responses at five different levels of complexity: perception, set, guided response, mechanism, and complex overt response.

WHAT IS TASK ANALYSIS?

We have been looking primarily at the type of behavior which the learner is to develop. We now change perspective to examine the sequences of the learner's tasks as he practices for mastery of the behavior. We are looking at the same objectives but from a different viewpoint. Since analysis means "breaking down into simpler elements," we shall examine learning tasks and seek to identify subtasks upon which mastery of the terminal task depends.

Task analysis is essential in a systems approach to instruction: it makes mastery of a subject possible by identifying small, component, learner steps each of which is possible to master with adequate learner practice.

For example a person who has never seen the pilot's compartment of an airplane can learn to fly the plane if the process is broken down into small enough steps, properly sequenced, and each step mastered before proceeding to the next. Faulty task analysis or improper sequencing can lead to learning failures.

> Task analysis means breaking down a learning (which is identified by an objective) into component tasks, each of which must be mastered as a prerequisite to mastery of the total task.

To analyze a learning task, we begin with a statement of the terminal objective. When phrased in terms of the learner behavior the objective tells what the learner will be able to do following the instruction. To analyze the overall task, we ask such questions as: What must the learner be able to do to achieve the objective? What kinds of learnings are involved? What prior skills are necessary? What specific knowledge is required? What concepts or meanings must be understood? What is prerequisite to ultimate success?

In cognitive learning, the cognitive classification suggests the sequence in which learning tasks could be presented. For example, in order to apply a principle in a new situation, the learner must understand (be able to explain) the principle and he must recall acceptable words and phrases to use in speaking or writing about the principle. However, most learning tasks include a number of subtasks. Let's look at an example.

AN EXAMPLE OF TASK ANALYSIS

Suppose an objective in an English class were stated like this:

> "to be able to write a one-page expository paper supporting a political point of view."

What is the nature of the task? Since our frame of reference is college English, we may assume the student already possesses the psychomotor skills of handwriting or typing and ignore these in the task analysis, or we may wish to add them as objectives. In addition, the student must be able to tell the difference between a paper "about" some topic or political viewpoint and one which "supports" a political point of view, before he can write such a paper. The learner who has mastered this subtask (by practicing this specific kind of discrimination) has a clearer view of his goal and of his assignment.

What else is required to write an expository paper? To say that a paper is made up of paragraphs and that paragraphs are made up of sentences, and the abilities to compose each are subtasks, is to oversimplify the task. To illustrate, one subtask is to write the introductory paragraph - which is different from other types of paragraphs. What is required in order to write a good introductory paragraph? If "arouse interest" is one of the requirements, what does interest arousal require? Does it involve choice of words, length of sentences, a particular type of sentence, or the arrangement of sentences in the opening paragraph? If the learner's task (or subtask) is "problem-solving" (the problem being to write a paragraph which will arouse interest), what are the steps in solving the problem and what are the requirements at each step?

On the next page is an example of a simple task analysis, one of many that could be logically derived from the previous objective.

TASK ANALYSIS: To Write a One-Page Expository Paper

- Subtask 1: To discriminate between a "well-written" paper and one which does not meet the instructor's criteria.
  - Subtask a: To remember all of the instructor's criteria, or to review the list supplied asking successful questions about unclear criteria.
    - Subtask (1): To find out what the criteria are, if the previous list is misplaced. –
- Subtask 2: To write an introductory paragraph which arouses interest.
  - Subtask a: To discriminate between paragraphs which arouse interest and paragraphs which do not do so, with particular readers.
    - Subtask b: To identify the elements of a paragraph which arouse interest.
    - Subtask c: To select "arousal" words and phrases.
    - Subtask d: To write an introductory sentence which attracts attention.
      - Subtask (1): To discriminate between sentences which attract attention and those which fail to do so.
    - Subtask e: To evaluate the paragraph as written, using the criteria of a good introductory paragraph and/or to elicit the evaluation of peers or instructional staff.
- Subtask 3: To write a paragraph which supports the viewpoint.
  - Subtask a: To discriminate between paragraphs which support a viewpoint and paragraphs "about" a viewpoint.

Obviously each of the subtasks implies other subtasks.

Where you stop in the derivation of subtasks is a function of where you choose to have your instructional responsibility begin.

For a practice exercise in task analysis, let us consider a straightforward problem in training a grocery checker to calculate the individual price of "group-priced" items:

Objective:

Within ten seconds, student can correctly calculate the cost of one grocery item, given the cost of several such items, for example, 2/67¢, 4/25¢.

Please list two subtasks which are prerequisite to attainment of this objective:

Task Analysis:

1. ____

2. ____

To determine the adequacy of your task analysis, it is likely that two important subtasks are:

1. Student can correctly divide and round off 2-digit numbers by the numbers 2 through 9, or,
2. Student can correctly multiply 2-digit numbers by 1-digit numbers.

More fundamental subtasks might include:

a. -student can state that "any fraction of a cent should raise the cost of the item to the next higher whole cent," or

b. -student can translate the symbol "2/67¢" into the statement "two of these items cost 67¢."

To further validate a list of subtasks you should consult a fellow teacher and obtain his agreement that your subtask items are prerequisite to the objective. When you are attempting this process in your own teaching, a colleague is a reasonable source to validate your task analysis.

SUMMARY OF TASK ANALYSIS

Success in any task depends upon success in the prerequisite tasks, i.e., upon attaining the prerequisite skills, knowledges, and understandings. Therefore, prerequisites for any task must be identified. The learner must have previously acquired them or be provided practice in them at the time they are needed. The learner's success in any task depends, in part, upon the instructor's planning: upon identifying the prerequisites, upon determining whether the learner does (or does not) have them, and upon providing assurance that the learner has mastered them. A "good" task analysis therefore includes subtasks which identify the kinds of learnings that are essential for attainment of the objective.

OBJECTIVES FOR BOOKLET I

SPECIFYING AND ANALYZING OBJECTIVES

Objectives for this booklet:

1. After completion of this booklet, the participant shall correctly categorize a set of instructional objectives into the psychomotor, affective, and cognitive domains.
2. Given two psychomotor objectives, the participant shall correctly select the one which is highest in complexity.
3. The participant shall correctly rank three affective objectives in terms of whether the objective is high, medium, or low in the affective classification.
4. The participant shall correctly classify four cognitive objectives into the following categories: Knowledge, Comprehension, Application, and Analysis.
5. Given an instructional objective, the learner shall select from a list of subtasks those which are prerequisite to the objective.

Now complete the criterion test in order to determine whether this booklet has been effective and whether the objectives for this booklet have been achieved.

CRITERION TEST - BOOKLET I

Place a P, A, or C by each objective depending upon whether it is primarily Psychomotor, Affective, or Cognitive in nature:

1. Student shall draw an inked line with no discernible deviation in width. ____________
2. Student can correctly select the phrase describing 10 common map symbols. ____________
3. Student can summarize the arguments of 2 peers to the satisfaction of each. ____________
4. Student will request that campus discipline regulations be revised by a student committee. ____________
5. Student can apply band-aid without impairing sterility of the pad. ____________
6. Fewer than 10% of the students shall drop a class during the first 3 weeks. ____________

Read the next 2 psychomotor objectives and place an "X" after the objective which is more complex:

7. Student shall fill the hypodermic syringe without admitting air bubbles into the syringe. ____________

8. Student shall slowly advance the hypodermic needle into tissue near the surface of the wound, maintaining constant pressure on the syringe plunger. ____________

In the following 3 objectives, write "High" by the objective which is highest on the affective hierarchy and write "Low" by that which is lowest:

9. Student states that watching an assigned TV documentary program was interesting. ____________

10. Student watches a film in class. ____________

11. Student searches TV Guide for programs on science for his leisure viewing. ____________

One example of a cognitive objective at each of the levels Knowledge, Comprehension, Application, and Analysis is given below. Place the letters "K," "C," "Ap," and "An" in the appropriate blanks:

12. In his own words, student will state the meaning of the term "social system." ____________

13. After observing a public picnic ground, the student shall decide which social subgroups were present; he shall give them descriptive names, and shall state observations to defend his classification. ____________

14. Students will correctly define the terms "status" and "hierarchy." ____________

15. Given (1) an elementary school class roster, and (2) the name of the pupil selected by each pupil as "my best friend in class," student will identify the most popular pupils and the social isolates. ____________

Place a check by those subtasks which are necessary to the accomplishment of the objective:

Objective: Student shall swim 50 yards using breast stroke.

Subtasks:

16. Student can locate small object on bottom of pool. ____________

17. Student must tread water for 15 seconds. ______________

18. Student shall coordinate arm stroke and kick. ______________

19. Student shall coordinate breathing and arm strokes. ______________

20. Student shall shower before getting into public pool. ______________

NOTE:

After you have checked your answers to the criterion test, please turn to the last page in this booklet.

ANSWERS TO THE CRITERION TEST:

P 1.

C 2.

C 3.

A 4.

P 5.

A 6.

____________ 7.

X 8.

____________ 9.

Low 10.

High 11.

C 12.

An 13.

K 14.

Ap 15.

____________ 16.

____________ 17.

X 18.

X 19.

____________ 20.

Minimum performance for this booklet: 90% of the participants should get 90% of the criterion items correct.

APPENDIX A

THE CLASSIFICATION OF EDUCATIONAL OBJECTIVES

PSYCHOMOTOR DOMAIN

1.0 Perception - the essential first step; the process of becoming aware of objects, qualities, or relations by way of sense organs.

- 1.1 Sensory stimulation - the impingement of a stimulus upon one or more of the sense organs.
  - 1.11 Auditory
  - 1.12 Visual
  - 1.13 Tactile
  - 1.14 Smell
  - 1.15 Kinesthetic
- 1.2 Cue selection - identification of the cue or cues and associating them with the task to be performed.
- 1.3 Translation - relating of perception to action in performing a motor act: the mental process of determining the meaning of the cues received for action.

2.0 Set - a preparatory adjustment or readiness for a particular kind of action or experience.

- 2.1 Mental set - readiness in the sense of having made the anatomical adjustments necessary for a motor act to be performed.
- 2.2 Emotional set - readiness in terms of attitudes favorable to the motor act's taking place. Willingness to respond is implied.

3.0 Guided response - an early step in the development of skill. Emphasis is upon the abilities which are components of the more complex skill.

- 3.1 Imitation - the execution of an act as a direct response to the perception of another person performing the act.

- 3.2 Trial and error - trying various responses, usually with some rationale for each response, until an appropriate response is achieved.

4.0 Mechanism - the habituation of a learned response. At this level, the learner has achieved a certain confidence and degree of skill in performance of the act.

5.0 Complex overt response - the individual can perform a motor act that is considered complex because of the movement pattern required; a high degree of skill has been attained; the act can be carried out smoothly and efficiently.

- 5.1 Resolution of uncertainty - the act is performed without hesitation; the individual knows the sequence required and so proceeds with confidence.
- 5.2 Automatic performance - the individual can perform a finely coordinated skill with a great deal of ease and muscle control.

From: Simpson, Elizabeth Jane, The Classification of Educational Objectives, Psychomotor Domain. Urbana, Illinois: University of Illinois, 1966. (Unpublished project report.)

APPENDIX B

TAXONOMY OF EDUCATIONAL OBJECTIVES

AFFECTIVE DOMAIN

1.0 Receiving (Attending)

    1.1 Awareness (conscious of a situation, object, stage of affairs)

    1.2 Willingness to receive (giving attention but neutral toward the stimulus)

    1.3 Controlled or selected attention (selection of stimuli to be attended to: attention controlled by-the learner)

2.0 Responding

    2.1 Acquiescence in responding (compliance or obedience)

    2.2 Willingness to respond (voluntary response: proceeding from one's own choice)

    2.3 Satisfaction in response (behavior accompanied by a feeling of pleasure, zest, or enjoyment)

3.0 Valuing

    3.1 Acceptance of a value (shown by consistency of response to the class of phenomena with which a belief or attitude is identified)

    3.2 Preference for a value (sufficient commitment to a value so the individual will pursue, seek out, or want it)

    3.3 Commitment (belief involves a high degree of certainty bordering on faith; includes loyalty to a position, group, or cause; shown by efforts to convince others)

4.0 Organization

    4.1 Conceptualization of a value (shown by attempts to identify characteristics of an object or position valued and by expression of judgments about a value)

  - 4.2 Organization of a value system (bringing together a complex of values into an ordered relationship with one another)
- 5.0 Characterization by a value or value complex
  - 5.1 Generalized set (the individual acts consistently in accordance with the values he has internalized)
  - 5.2 Characterization (having developed a consistent philosophy of life or a code of behavior which becomes characteristic of the individual)

Adapted from: Krathwohl, David R., *et al.*, *Taxonomy of Educational Objectives, Handbook II: Affective Domain*. New York: David McKay Co., 1964.

APPENDIX C

TAXONOMY OF EDUCATIONAL OBJECTIVES

COGNITIVE DOMAIN

1.00 Knowledge (Recall of Specifics, Pattern, Structure, etc.)

    1.10 Knowledge of Specifics (specific bits of information)

        1.12 Knowledge of Terminology

    1.20 Knowledge of Ways and Means of Dealing with Specifics (Organizing)

        1.21 Knowledge of conventions (usages, styles, practices, forms)

        1.22 Knowledge of trends and sequences (with respect to time)

        1.23 Knowledge of classifications and categories (arrangements, classes)

        1.24 Knowledge of criteria (judging facts, principles, opinion, criteria)

        1.25 Knowledge of methodology (techniques, methods of inquiry)

    1.30 Knowledge of Universals and Abstractions (theories and generalization)

        1.31 Knowledge of principles and generalizations (particular abstraction)

        1.32 Knowledge of theories and structures (body of principles, range of specifics systematic view)

Intellectual ABILITIES and SKILLS

2.00 Comprehension (relating knowledge to other material or seeing the full implication)

    2.10 Translation (paraphrasing or restructuring ideas)

    2.20 Interpretation (summarization, reorganization)

    2.30 Extrapolation (extension of trends beyond given data)

3.00 Application (use of abstractions in concrete situations)

4.00 Analysis (the breaking-down of information into its elements)

  4.10 Analysis of elements (distinguishing facts from hypothesis, etc.)

  4.20 Analysis of relationships (connections and interactions of parts of a structure of knowledge)

  4.30 Analysis of organizational principles (organizational systematic arrangement)

5.00 Synthesis (putting together of elements and parts to form structure)

  5.10 Production of a unique communication (communicating to others)

  5.20 Production of a plan or proposed set of operations

  5.30 Derivation of a set of abstract relations (formulating hypotheses or propositions)

6.00 Evaluation (quantitative and qualitative judgments, using standards of appraisal)

  6.10 Judgment in terms of internal evidence (logical accuracy, internal consistency, etc.)

  6.20 Judgment in terms of external criteria (evaluation of internal data to outside influences and selected criteria)

Adapted from: Bloom, et al., Taxonomy of Educational Objectives, Handbook I, Cognitive Domain. New York: David McKay Co., 1956.

REVISION DATA SHEET - BOOKLET I

Please complete this sheet and mail to:

The Johnsons
Regional Education Laboratory
for the Carolinas and Virginia
Mutual Plaza
Durham, North Carolina 27701

Instructions:

As you work through these booklets you will realize that the authors are committed to the use of achievement data to revise instructional materials and procedures.

Please review your answers to the practice exercises in the booklet. Mark below any exercise where your answer did not match the "correct" answer. By doing this you will help us identify areas in the booklet where we have failed to provide adequate instruction. Please feel free to comment on your reasoning or sources of confusion for any exercise which you missed (i.e., we failed). Also, mark any criterion test item which you missed. Be assured that this revision data sheet will be reviewed by us with intense interest! Your responses will guide our revisions.

The Johnsons

Practice Exercises:

Page

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Criterion Test:

Page

18. ________1.
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________ NAME ________ TEACHING AREA ________ SCHOOL ________ DATE

BOOKLET II

MEASURING ATTAINMENT OF OBJECTIVES

Stuart R. Johnson

RELCV Working Paper

RELCV, a private non-profit corporation, is a regional education laboratory funded primarily by the United States Office of Education under provisions of Title IV of the Elementary and Secondary Education Act of 1965. The opinions expressed in this paper do not necessarily reflect the position or policy of the Office of Education, and no official endorsement by the Office of Education should be inferred.

REGIONAL EDUCATION LABORATORY FOR THE CAROLINAS AND VIRGINIA
Mutual Plaza, Durham, North Carolina 27701

MEASURING ATTAINMENT OF OBJECTIVES[1]

Stuart R. Johnson

Obtaining Evidence of Learners' Achievement of Instructional Objectives

Systematic approaches to the development of instructional programs invariably stress the need to define the goal or objectives in terms of student behavior. From the behaviorally stated objectives it is possible to derive specific measuring procedures ("criterion measures") to obtain evidence of program effectiveness. Regardless of the type of desired outcome of any system, information is needed regularly as to whether the predicted outcome (i.e., objective) is gradually being accomplished. Obtaining this information is referred to as a measurement process; the process consists of two steps... some sort of observational comparisons are necessary as well as a means to record the observations.

For the purposes of this paper it is important to note three separate possible uses of measurement data. In an instructional setting, these three uses may be illustrated as follows:

1) Measurement data may be fed back immediately to the learner. This instructional practice is referred to as "reinforcement" for correct responses or giving "knowledge of results," as implied when directions are given to the learner as to his next steps (review, restudy or continue on to new tasks).

---

[1] Some of the procedures are described more fully in a most helpful and entertaining paperback: Webb, Eugene J., et. al., Unobtrusive Measures: Monreactive Research in the Social Sciences. Chicago: Rand McNally & Company, 1966.

2) Measurement data may be used to accept or reject an instructional system. For example, a teacher might conclude on the basis of poor learner performance that a given workbook was unsatisfactory and should not be used again.

3) Measurement data may be used in order to improve an instructional procedure or system.

It is this third and last consideration that guides the comments in this paper. Although the first two uses are are perfectly appropriate uses for measurement data, this paper deals with measurement procedures especially for the purpose of upgrading the effectiveness of the instructional system through repeated revision.

In the previous booklet ("Specifying and Analyzing Objectives") you have undertaken the development of a variety of instructional objectives. In this exercise you will develop a rationale for measurement procedures which provide evidence of learners' achievement of objectives.

After the completion of this instruction you should be able to recognize a number of measurement procedures which can serve as criterion measures for specified instructional objectives.

In addition you should be able to distinguish product from process criterion measures as well as distinguish reactive from non-reactive measures.

You should be able to distinguish minimum performance standards from either instructional objectives or their criterion measures.

CRITERION MEASURES

Once a set of instructional objectives has been selected, specific procedures must be developed to gather evidence as to whether the objectives have been met. Problems of confusion and learner misdirection will arise if these evidence gathering procedures are not made specific prior to instruction. For example, consider the following objective:

> The learner shall commit himself to a position with regard to Fair Housing.

There is no way to know, (when later trying to gather evidence of student learning) whether the instructor wanted the learner to:

- sign a petition,
- write a letter to a legislator,
- write an essay on Fair Housing,
- raise objections in class discussion about unfair housing practice,
- ask for the address of a local ACLU chapter,
- volunteer to head up a committee on Fair Housing practices, or,
- simply state in a paper and pencil test that he favored Fair Housing legislation.

Any of the above behaviors might reflect commitment. For this reason, it is important that the instructor makes explicit in his plans (in advance of instruction) some of the specific criterion measures he will use to determine whether the objective has been achieved.

> Criterion measures allow the collection of evidence of change in behavior, thus giving evidence of instructional effectiveness.

Examples of criterion measures might include any procedure which will *yield a numerical index of performance*:

- a multiple-choice or true-false test with scoring key,
- a rating scale or scoring sheet for essay questions, constructed response, term papers, book reports, etc.,
- a check sheet, rating scale, interview schedule, or observational record form to measure a student's verbal or psycohomotor performance,
- counts or tallies of types of observed behavior.

In order that you may be completely clear about the relationship between objectives and criterion measures, examine the following objective and criterion measures, and mark that alternative which describes a criterion measure for the objective:

Objective: The learner will recognize examples of inductive reasoning.

☐ Alternative A. Learner underlines those sentences in a newspaper editorial which constitute an inductive argument.

☐ Alternative B. Learner reads the textbook description of deductive vs. inductive reasoning.

☐ Alternative C. Learner writes short essay in which he describes the essential characteristics of inductive reasoning.

Alternative A describes a situation wherein the learner "recognizes examples of inductive reasoning," the behavior called for in the objective. By contrast, Alternative B describes an activity which assists the learner in *achieving* the objective, but it does *not* result in an index of the learner's ability to *perform* the behavior described in the objective. Alternative C would give evidence of the learner's descriptive capabilities, but, again would *not* tell whether the learner could "recognize" examples of inductive reasoning.

Only Alternative A describes a criterion measure which will *yield a numerical index of performance*.

If you are still a bit uncertain about criterion measures, try one more example. Which alternative describes a criterion measure for the objective shown?

Objective: Student will calculate prices of items of merchandise which are to be discount-priced during a "1/3 Off" Sale.

☐ Alternative A. Learner explains the procedure by which percentages are calculated.

☐ Alternative B. Learner prepares price tags for sale items originally priced at $1.98 and other common prices.

☐ Alternative C. Learner assists parent in choosing a lower priced product from alternatives on sale in the supermarket.

The correct answer is "B" since the objective indicates that the student will "*calculate*" rather than simply describe a procedure for making the calculations. The criterion measure (in this instance) is the number of correctly completed sales price tags, *i.e.*, the numerical index of performance would be the number of accurate pricings out of the total possible (in the form of correctly filled-out price tags).

Instructors often focus exclusively upon the use of paper-and-pencil tests as criterion measures without taking advantage of other types of evidence gathering procedures. In order to assure that a broad variety of criterion measures have been considered, two different schemes are suggested.

- The use of product *vs*. process criterion measures.
- The use of reactive *vs*. non-reactive criterion measures.

PRODUCT-PROCESS CRITERION MEASURES

The product-process distinction is quite straightforward. A teacher might express the distinction by saying: "I can assess a student's performance by watching him in action, or by examining what he makes." This idea underlines the distinction between "product" and "process" measures:

- .Product measures give some tangible evidence of a learner's performance which can be stored or filed for later reexamination if desired.
- .Process measures allow the collection of evidence of a learner's performance only as it occurs.

Which of the following is a product measure?

☐ .A procedure which measures what learners have constructed.

☐ .A procedure which measures what learners are doing.

The first statement describes a product measure; the second describes a process measure.

The examples (below) may help to further clarify the product-process distinction:

Product Measures	Process Measures
Procedures for comparing:	Procedures for comparing:
-any written responses such as those on tests, term papers, essays, book reports	-any spoken responses such as those made in dramatizations, public speaking, foreign language, technical discussion
-any constructed materials such as paintings, musical scores, diagrams, maps, devices, models	-some psychomotor performance such as the form used while stroking keys of a musical instrument, throwing a baseball, pouring liquid chemicals

Of the learner's performances below, indicate which involve "product" criterion measures and which involve "process" criterion measures. Place "Prod" or "Proc" in the boxes to the right.

The learner will:

- .prepare a circuit diagram, ☐
- .write a short poem about childhood, ☐
- .question a fellow student without arousing hostility, ☐
- .open a student government meeting with the pledge of allegiance. ☐

The first two yield tangible products which will require procedures for rating the product. The last two require establishing procedures for observing and rating learner performance as it occurs.

In the next list of criterion measures below, indicate in the same fashion whether each is a product or process measure.

Rating scales or scoring sheets for:

1. Interpretive reading of an eulogy ☐
2. a contour map drawn from given elevations. ☐
3. a half-gainer dive ☐
4. a flow diagram ☐
5. signalling a right-hand turn ☐

You were correct if you indicated the following answers:

1. Proc
2. Prod
3. Proc
4. Prod
5. Proc

REACTIVE AND NON-REACTIVE CRITERION MEASURES

Let's look, now, at the second scheme mentioned earlier which can help generate a broader variety of criterion measures.

The terms "reactive and non-reactive" suggest that some measures may be reactive, i.e., may change the natural response we would be interested in prompting and measuring.

For example, students often speak of the desirability of "psyching out" the instructor so as to know what position to take during class discussions or in writing answers to test questions. Therefore, common standard testing procedures such as quizzes and examinations represent examples of reactive measures, at least to the extent that the students know the kinds of responses previous instructors have looked for.

To illustrate, suppose that an instructor in a Health Science class asks his students to list some reasons for (or against) the practice of smoking marijuana. If the students are aware that the instructor's scoring procedures will reward only those reasons given for not smoking marijuana, then this measurement via a test question represents a reactive criterion measure since it leads the students to modify the responses they might otherwise have given.

Examples of less reactive measures in this context might be:

- submitting a "contemporary word meanings" questionnaire where students are asked to match words common to the marijuana smoking sub-culture with their meanings in everyday English.
- Observing and recording how students choose sides in a proposed debate on the topic "Should Marijuana Be Legalized?"

Suppose a speech instructor is concerned that students use particular speech practices which he is trying to strengthen. Which of the criterion measures below is likely to be least reactive, and result in the more accurate data?

- .Listening to a 60 second impromptu talk in class, ☐
- .Listening to a classroom discussion of a controversial topic, among peers, in a "buzz session." ☐

It is more probable that the discussion with peers will be least reactive and that speech habits will emerge more naturally in the "buzz session" than in the speech to the class.

In the situation below, select the criterion measures which you feel would be least reactive: Please place a check mark by those you choose.

1. Instructor decides to determine the extent to which his class is doing outside reading of reference materials.

☐ .he tallies the number of hands raised in response to the question "How many were able to do some reference reading?"

☐ .he tallies the number of enrollees names on a library check-out sheet for reference materials.

2. A typing instructor hopes that students will use the correct form for letters of correspondence.

☐ .he assigns students to submit a letter (to a hypothetical company) requesting an appointment for an employment interview; letters are obtained and scored.

☐ .he asks that students write and mail a "thank you" letter to a guest speaker who visited the class; letters are obtained and scored.

You were correct if you selected the second option in both cases above. Both of the first alternatives are more likely to make the students aware of the desired behavior sought by the instructor.

SETTING STANDARDS OF MINIMUM ACCEPTABLE PERFORMANCE

So far in this paper you have been urged to consider a broader variety of criterion measures which would enable you to assign a performance index (e.g., a score) or performance indices (e.g., multiple scores) to observations of student behavior. Thus when we have obtained a series of scores or performance indices following instruction, we are then, (and only then) in a position to decide whether the instructional program has measured up to expectation or whether the program needs revision. Making the decision as to what you will set as a standard of acceptable performance on the part of the learner is called setting minimum performance standards.

For example, suppose that an instructor has decided that he wants learners:

> to identify common insects by their scientific names.

He obtains 10 pictures of common insects and tells his students:

> "Look at each picture carefully and then write in the blank on your answer sheet the scientific name of each insect. You will be given one point for each name that is correct according to the identifications given in your textbook."

This instructor then decides that the instructional program shall be deemed successful if:

> 80% of the students correctly write the scientific names of 90% of the insects pictured.

Now, please reread the above and decide which statement is the instructor's overall objective, which is the statement of the criterion measure, and which statement describes minimum performance standard.

You probably recognized that the last phrase represented the minimum performance standard and the first phrase represented his general objective. Obviously, the middle phrase describes the criterion measure.

MULTIPLE CRITERION MEASURES

In attempting to obtain evidence of the learner's ability to perform the behavior described in the instructional objective it is desirable to employ several different kinds of criterion measures. The use of multiple criterion measures should produce a more reliable estimate of performance than any single measure. Especially in those cases where a measure is a) difficult to obtain, b) predictably reactive, or c) obtainable only in some distant future, multiple criterion measures are called for. It is desirable that an instructional plan contain several measures of criterion performance even though only one or two are ultimately used.

This paper has presented two schemes for categorizing multiple criterion measures. It should be noted that other schemes have been proposed. One particularly helpful approach has been attached to this paper as an Appendix. The examples provided will assist you by suggesting usable criterion measures as you develop your own objectives and measures.

SUMMARY

This paper has provided instructions so that you might learn to accomplish the following tasks:

- to identify those measurement procedures which are suitable as criterion measures (i.e., those which measure the behavior called for in the objective).
- to distinguish between product and process criterion measures.
- to distinguish between reactive and non-reactive criterion measures.
- to distinguish between an overall objective, a criterion measure for that objective, and a minimum performance standard to indicate satisfactory attainment of the objective.
- to derive a number of criterion measures meeting the above standards, given an objective.

Please complete this practice exercise so that an assessment can be made as to the extent to which this booklet has been successful. The minimum performance standard for this paper predicts that 85% of you will be able to attain a perfect score. If the standard set for your performance is not met, the booklet will be modified.

CRITERION EXERCISE

I. Please select the alternative most appropriate as a criterion measure for the objective.

Objective: Learner will decide if a given author is"for" (or against) a given political viewpoint.

☐ Alternative A. Learner will read the author's political essay.

☐ Alternative B. Learner will describe in writing the author's position and note whether (or not) the author is favorable to a political action.

☐ Alternative C. Learner will tell why the author takes a certain political stand.

II. Adjacent to each criterion measure below, indicate which are product (prod) and process (proc) measures.

A rating scale or scoring sheet for:

A. safe handling of a power saw ☐ A.
B. a typed inter-office memo ☐ B.
C. choral reading in unison ☐ C.
D. a soldered wire ☐ D.
E. a set of completed equations ☐ E.
F. an historical time-line ☐ F.
G. posture while writing ☐ G.

III. For each of the following situations, select the criterion measure which is least reactive: (Note: Least reactive.)

Situation: Instructor wishes to determine how many of his students enjoy solving problems in mathematics.

Possible Criterion Measures:
(Please check least reac.)

☐ A. He counts the number of students who raise their hands in response to the question, "How many of you enjoyed solving these problems today?"

☐ B. He collects and tallies responses to a questionnaire he submits which asks if students enjoy solving math problems.

☐ C. He provides several free-choice activities and notes how many students elect to solve math problems from the range of alternative activities presented.

Situation: Instructor wishes to find out if students think it important to keep their workshop machinery in good condition.

Possible Criterion Measures: (Please Check Least Reactive)

☐ A. He counts those who mention this in their lists of "Things to do to improve our classroom workshop."

☐ B. He counts those who nod their heads in agreement when he suggests that they keep their workshop machinery in good condition.

☐ C. He observes and counts those learners who volunteer to clean up the workshop and repair the machinery.

IV. Label each of the phrases below as being either an overall objective (O), the criterion measure (CM), or the minimum level of acceptable performance (MLP).

Write O/CM/MLP
in boxes

☐ A. "Three-fourths of the learners will correctly sequence all of the steps needed."

☐ B. "Learners will be able to correctly sequence the steps necessary to diagnose malfunction in a T. V. set."

☐ C. "Given a scrambled list, learner will unscramble the list and be scored "credit" if all steps are in correct sequence."

END OF CRITERION EXERCISE

Your answers to the criterion exercise should have been:

I. B

II. A. Process
    B. Product
    C. Process
    D. Product
    E. Product
    F. Product
    G. Process

III. C.
    C.

IV. A. MLP
    B. O
    C. CM

APPENDIX

CRITERION MEASURES TO DETERMINE LEARNER ACHIEVEMENT[2]

Standardized criterion measures

1. Standardized achievement and ability tests, the scores from which inferences are made regarding the extent to which cognitive objectives have been attained.

2. Standardized rating scales and check lists for judging the quality of products in visual arts, crafts, shop activities, creative writing, exhibits for competitive events, cooking, typing, letter writing, fashion design, and other activities.

3. Standardized tests of psychomotor skills and physical fitness.

4. Standardized self inventories designed to yield measures of adjustment, appreciations, attitudes, interests, and temperament from which inferences can be formulated concerning the possession of psychological traits (such as defensiveness, rigidity, aggressiveness, cooperativeness, hostility, and anxiety).

Teacher-made criterion measures

5. Achievement tests (objective and essay): the scores on which allow inferences regarding the extent to which specific instructional objectives have been attained.

6. Rating scales and check lists: for observation of classroom behaviors; performance levels of speech, music, and art; manifestation of creative endeavors, personal and social adjustment, physical well-being.

7. Questionnaires: frequencies of responses to items in an objective format and numbers of responses to categorized dimensions developed from the current analysis of responses to open-ended questions.

8. Interviews: frequencies and measurable levels of responses to formal and informal questions raised in a face-to-face interaction.

---

[2] Adapted from A Paradigm Involving Multiple Criterion Measures for the Evaluation of the Effectiveness of School Programs. Written by Newton S. Metfessel (University of Southern California) and William B. Michael (University of California, Santa Barbara). Offset, 10 pp.

9. Self-evaluation measures: student's own reports on his perceived or desired level of achievement, on his perception of his personal and social adjustment, and on his future academic and vocational plans.

10. Peer nominations: frequencies of selection or of assignment to leadership roles for which the sociogram technique may be particularly suitable.

11. Projective devices: such as casting characters in a class play, role playing, and picture interpretation based on an informal scoring model that usually involves the determination of frequencies of specific behaviors, or ratings of their intensity or quality.

Miscellaneous criterion measures

12. Absences: full-day, half-day, part-day and other selective indices pertaining to frequency and duration of lack of attendance.

13. Anecdotal records: critical incidents noted including frequencies of behaviors judged to be highly undesirable or highly deserving of commendation.

14. Attendance: frequency and duration when attendance is required or considered optional (as in club meeting, special events, or off-campus activities).

15. Books: number checked out of library, numbers renewed, numbers reported read when reading is required or when voluntary.

16. Changes in program or in teacher as requested by student: frequency of occurrence.

17. Choices expressed or carried out: vocational, avocational,and educational (especially in relation to their judged appropriateness to known physical, intellectual, emotional, social, aesthetic interests, and other factors).

18. Dropouts: numbers of students leaving school before completion of program of studies.

19. Grouping: frequency and/or duration of moves from one instructional group to another within a given class grade.

20. Library card possessed or not possessed: renewed or not renewed.

21. Peer group participation: frequency and duration of activity in what are judged to be socially acceptable and socially undesirable behaviors.

22. Skills: demonstration of new or increased competencies such as those found in physical education, crafts, homemaking, and the arts that are not measured in a highly valid fashion by available tests and scales.

23. Tape recordings and video-tapes: critical incidents are recorded and other analyzable events amenable to classification and enumeration.

BOOKLET III

ARRANGING INSTRUCTIONAL ACTIVITIES

Rita Johnson

RELCV Working Paper

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REGIONAL EDUCATION LABORATORY FOR THE CAROLINAS AND VIRGINIA
Mutual Plaza, Durham, North Carolina 27701

ARRANGING INSTRUCTIONAL ACTIVITIES

Rita Johnson

You have already selected your instructional objectives and developed multiple criterion measures for a target group of learners. In order to arrange an instructional sequence it is necessary now to specify in detail what is needed to accomplish these objectives.

Such a set of specifications is typically produced by advanced planning engineers and then passed on to others who are directly responsible for actual technical-production efforts. Instructors however, usually prepare their own comprehensive lesson plans or sequential units prior to instruction. Once such a unit has been carefully outlined, any other instructor should be able to teach from such specifications with minimum difficulty.

Therefore, the purpose of this booklet is to help you in the preparation of an organized instructional sequence which will later be produced and tested.

Careful attention to this booklet should help you to do the following:

- recognize a variety of instructional variables which, when applied, could alter or determine your instructional sequence;

- organize an instructional unit which incorporates all aspects of the instructional design thus far, including specifications of what is needed by the instructor and the learners before instruction can occur;
- arrange instructional activities and material into a sequential pattern which utilizes a broad variety of instructional variables.

COMMON INSTRUCTIONAL VARIABLES

Below are some of the more commonly accepted variables which research findings suggest affect learning. It may be that not all or any of these are necessary for effective teaching. It remains for the instructor to select from as wide a range of alternatives as possible in hopes that these will be effective. Once he includes them in his instructional sequence, he is in a better position later to empirically test whether or not these variables indeed make a difference.

1. ADVANCE ORGANIZER. An advance organizer is analogous to a preface in a text. It is a statement by the instructor which provides the learner with a kind of cognitive structure or "set" such as a key phrase which signals the important topic yet to come.

    One example would be a paraphrased objective, such as, "Today we are going to learn about the ways in which..."or"Our immediate problem is...." and "Let's find out if..."

2. **PERCEIVED PURPOSE**. This refers to questions or statements by the instructor which prompts the learner to perceive the importance or purpose of the instruction to follow. Emphasis here is on the need for the students to perceive why or how what they are about to do is purposeful or meaningful to them.

   For example, the instructor may ask, "How will solving this problem help us when we try to...?" or "How can this be useful to you on the job?" He might also note, "This will make you more efficient when you try to..."

3. **MULTIPLE ELICITORS**. These refer to a series of questions and/or statements designed to produce an intended series of learner responses which are at successively higher levels of task (e.g., re: Bloom's *Taxonomy*). Such statements prompt the learner to perform in a series of ways which gradually lead to the response specified in the objective.

For example:

> "Do you recall that objectives are statements of intended behavior changes in the learner?" (Recall)
>
> "Stated differently, does this mean that teaching consists of changing the learner's behavior?" (Comprehension)
>
> "What, then, do teachers change when they hope to affect a student's attitude in the classroom?" (Application)
>
> "In the film you are about to see, how many attitudinal behavior changes can you identify?" (Analysis)
>
> "Now write an instructional plan which includes at least three attitudinal changes in your objectives." (Synthesis)

Not all elicitors produce a *desired* or intended response. If the objective calls for "discriminating fact from fiction," an elicitor which asks students to "listen" to some material may or may not be very helpful, depending upon whether or not "listening" behavior is part of a series which will lead to "discriminating" behavior.

Advance organizers, statements of purpose and elicitors are motivational in intent. In the space provided, place an O, P or E beside each quote to show if it is an Organizer, statement of Purpose, or Elicitor.

Objective: Learner will calculate prices of items which are to be discounted.

1. "How will learning to do this help you as a consumer?"
2. "What is the price of this washing machine which is to be discounted by one-third?"
3. "Now let us look at the problem of determining discount prices at a market."
4. "Calculate the prices of the following four items."

Answers: 1. _P_ because it forces the learner to analyze why the learning will be important to him.

2. _E_ because it elicits the intended behavioral response.

3. _O_ because it organizes or provides a "set" in advance of instruction.

4. _E_ because it elicits an intended response.

4. _PROMPTS OR CUES_. These refer to hose hints or aids the instructor provides in order to help the learner accomplish a desired response. These may be provided when the learner is recognized as having difficulty or when the instructor wants to _insure_ success, such, "Watch out now. I may try to fool you." and "Pay close attention. This problem is complex."

Some common examples of cuing include:

"_Remember_ yesterday we said that..."

"If _this_ is true, what about...?"

"When you hear the poem, _listen_ for..."

"As you watch, _notice_ whether or not..."

"Can you find _three_ instances where...?"

5. _PRACTICE_. This refers to activities which give the learner opportunity to practice the specific behavior to be accomplished by the end of instruction. Without opportunity to practice relevant or "appropriate" behavior, the learner is not as likely to perform well on the criterion test.

As in the case of multiple elicitors, there are multiple opportunities to practice, each of which successively approximate the desired response specified in the objective.

Practice, then, should be consistent with the objective and the criterion measures. Generally speaking, the relationship is as follows:

Objective: A statement that students are expected to perform in a certain way.

Practice : Students are given several chances to perform in that way.

Criterion Measure: Students are tested on whether or not they can perform in that way.

For the following objective which two learning activities are the best examples of "relevant" practice?

Objective: Learner will label common insects with their scientific names:

☐ 1. Reading about the names given to common insects

☐ 2. Watching a film on insects

☐ 3. Writing the names of insects under pictures of insects.

☐ 4. Matching pictures of insects with printed names on cards.

Answers: 3 and 4.

6. SMALL STEPS. Programmers are foremost advancers of the need for small steps to accomplish learning. How small each step should be depends in part upon the complexity of the task, difficulty of the content, ability of the learner, and so forth. If the steps are too small, boredom may occur. However, lengthy chunks of content can be tedious and difficult.

7. PACING. Related to the problem of making the learning task simple yet challenging, is the problem of whether the sequence is too fast or too slow. Pacing refers to the rate at which the learner must go through the instructional material or activities.

8. GRADUATED SEQUENCE. Learner behavior can be arranged in successive steps until the criterion performance is reached. Likewise, the activities and content of instruction could be graduated in sequence until they approximate the behavior and content implied in the objective.

   A number of logical sequences have been suggested. None, however, have proved significantly better than any other. In fact, some studies have demonstrated that when frames in a programmed sequence are scrambled, learning does not significantly decrease!

   Commonly used sequences have been:

   from simple to complex
   from facts to generalizations
   from concrete to abstract
   from practical to theoretical
   from meaningful to unknown
   from past to present
   from present to future

9. KNOWLEDGE OF RESULTS. This refers to responses given back to the learner which tells him how well he has just performed. When a student gets feedback on when and why he is right or wrong,

he can take steps to improve and is more likely to repeat the correct response next time.

Some instructors tell learners why they were incorrect, then give them an opportunity to try again. In this way learners are getting additional practice until they make the appropriate response and can be told they are correct.

10. POSITIVE REINFORCEMENT. This refers to anything the instructor does which tends to increase the probability that the student will perform in the same way and repeat his response in the future. Certain instructor behaviors serve as rewards or "reinforcers" for the learner. Such reinforcers are likely to elicit similar responses next time.

For example, an instructor's smile, nod of the head, or softening of the voice could serve to reinforce some students. Knowledge of having correctly performed is also a reinforcer.

However, what is reinforcing to one learner may not be to another. It is therefore important to examine the type of reinforcer used and determine its appropriateness for a learner's particular age, sex or background.

Thus far you have examined a broad variety of instructional variables which could be incorporated into your instructional sequence. Before these can be arranged, however, it will be helpful to detail all other aspects of your instructional system thus far.

PREPARING THE UNIT OF INSTRUCTION

There are many types of format which could be used to detail specifications for a unit. A simple one can be found in APPENDIX I. You should refer to this form now before you read an explanation of each of the categories listed below.

After filling in the details at the top of the form (if they apply to you) plan to complete the following:

1. Prerequisites.

   List those skills, concepts and attitudes which you assume the learner possesses upon entering the instructional environment.

2. Objectives.

   List here the objectives you intend to accomplish as a result of your instructional environment.

3. Criterion Measures.

   For each objective, list the criterion measures which will enable you to assign scores to observations of student behavior.

4. Learner Activities.

   Foreach objective, list the activities you intend to provide the learner so that he may learn to perform intended responses. At this stage, they need not be in any graduated sequence. Since this is only a worksheet or mock-up of specifications, brainstorming appropriate activities may prove to be very useful.

   At all times the criterion to use for selecting such activities is whether or not they will help the learner to acquire practice needed for accomplishing the objective.

5. Related Content.

For any activity there may be potential reading material which will help the learner to respond in appropriate ways. List here the exact chapters, pages and names of relevant books, magazines or articles which have reference material for use by you or your students during the activity.

6. Media and Materials.

Later you will be helped to select and produce a variety of instructional media and materials. At this point, you may want to list audio-visual aids or media which you suspect are meaningfully related to the activity or the content of the objective. If you know of specific films, filmstrips, slides, photos, recordings, kits, transparencies or aids, this is a good time to list them.

Again, the criterion to use for selecting media is whether it will help the learner practice what is needed to accomplish the objective. In this way, the learner stands assured of performing well on the criterion test and you stand assured of being successful.

Brainstorming may help to produce a rich range of alternatives that may prove useful. These can always be discarded later. Remember that if an activity or medium is selected which bears no relation to your objective, several alternatives are still possible:

a. a new objective could be added,

b. an existing objective could be modified,

c. the activity or medium could be altered to fit the objective, or

d. the activity or medium can be dropped.

Self-checking procedures are needed to re-establish your original intentions. Frequently, especially after many changes in your chart have taken place, it is wise to stop and see whether or not all aspects of the chart are internally consistent with your original objectives. A checksheet is provided for this purpose in APPENDIX 2.

Since it is assumed that the completion of the list will take time, it is suggested you leave the chart and checklist for now and continue finding out about ways to sequence your unit once the chart is completed.

SEQUENCING THE INSTRUCTIONAL ENVIORNMENT

There is more than one way to arrange a unit of work into a sequential pattern. The two suggested here involve:

a. arranging the content or lecture material, and

b. arranging the learners' activities or behavioral responses.

In the first case, the lecture or expository material is simply written out in some logical order (e.g., from simple to more complex) and divided into smaller chunks or lengths at appropriate intervals. Each "chunk" then becomes a sort of "frame" to which may be added a variety of instructional variables.

For example, to each "frame" might be added:

a. an advance organizer

b. a statement to provide purpose

c. elicitors
d. some prompts to cue the correct response
e. an opportunity to respond (i.e., practice) and
f. immediate feedback to the learner as to how well he responded.

It is not necessary that these variables be repeated with regularity in each frame. For example, intermittent prompts (i.e., cuing heavily at first, then gradually reducing cues until they are no longer needed) is very effective. Withdrawal of prompts allows the learner to approximate more and more that behavior which is most like the criterion test performance (which will offer him no prompts at all).

At any rate, a certain degree of purpose, opportunities for appropriate practice and feedback of results would probably increase the effectiveness of your sequence a great deal.

A second way to arrange a sequence is to list the activities for each objective on your list in graduated sequence (e.g., from simple to complex re: Bloom's Taxonomy).

Again, each activity then becomes a "frame" or chunk of time around which relevant content and a variety of instructional variables may be incorporated.

For example, one simple rule could become:

a. Tell the student what he's to do (prompt or elicit)
b. Let him do it (provide opportunity for practice)
c. Tell him if he did it (knowledge of results)

It now remains for you to select and develop appropriate media which may considerably alter this tentative sequence.

The test below asks you to recognize the meaning of some important terms. If the author is successful, 90% of the readers will attain a score of 80% or better.

In the space provided, write the letter of the statement that best describes each term:

_____	1.	Advance Organizer	a.	A statement designed to produce an intended response in the learner.
_____	2.	Perceived Purpose	b.	What the instructor does so that the learner is likely to repeat the response next time.
_____	3.	Elicitors	c.	A statement which aids or helps the learner to be successful in his response.
_____	4.	Prompts or Cues	d.	A measure by which a score can be assigned to judge a learner response.
_____	5.	Practice	e.	Arranging activities and related content into manageable "chunks" of learning.
_____	6.	Small Steps	f.	A statement which provides a "set" for learning.
_____	7.	Pacing	g.	Speed with which learners must grasp the material.
_____	8.	Graduated Sequence	h.	A statement telling a learner whether or not he is responding correctly.
_____	9.	Knowledge of Results	i.	When the learner knows why or what he's about to do is meaningful to him.
_____	10.	Positive Reinforcement	j.	Arranging a pattern of activities so that they successively approximate the behavior in the objective.

k. An activity which provides opportunity to engage in the intended behavior.

l. A statement of what learner is to do as a result of instruction.

Below are the answers to the criterion test. If you did not attain a perfect score you may want to reread the section, COMMON INSTRUCTIONAL VARIABLES again.

1. f
2. i
3. a
4. c
5. k
6. e
7. g
8. j
9. h
10. b

It is suggested that you now do the following:

1. Fill out the form in APPENDIX 1. Let others help you brainstorm ideas.
2. When completed, use the checksheet in APPENDIX 2 to check for internal consistency with original objective.

3. For one objective, write an outline of a script for a sequence of instruction which utilizes at least five instructional variables. Begin by arranging either the content material or learner activities.

APPENDIX 1

Topic or Unit:__________ Student:________________ Block of time:____________

Institution:____________ Title of Course:___________ Instructor's name:____________

Prerequisites	Objectives	Criterion Measures	Learner Activities	Related Content	Media and Materials
1.	1.	1. a. b. c. d.	1. a. b. c. d.	1. a. b. c. d.	1. a. b. c. d.
2.	2.	2. a. b. c. d.	2. a. b. c. d.	2. a. b. c. d.	2. a. b. c. d.
3.	3.	3.	3.	3.	3.
4.	4.	4.	4.	4.	4.

APPENDIX 2

CHECKLIST

CHECKLIST:

1. Do the students still possess the prerequisites needed as entering behaviors?
2. Are your criterion measures still measuring behavior implied in the objective?
3. Are all learner activities still relevant or helpful in accomplishing the objective?
4. Is all content still related or of help in accomplishing the objective?
5. Are the media and materials still related clearly to some objective? Will their use help students perform well on the criterion test?

BOOKLET IV

SELECTING AND DESIGNING METHODS AND MATERIALS

Rita Johnson

RELCV Working Paper

RELCV, a private non-profit corporation, is a regional education laboratory funded primarily by the United States Office of Education under provisions of Title IV of the Elementary and Secondary Education Act of 1965. The opinions expressed in this paper do not necessarily reflect the position or policy of the Office of Education, and no official endorsement by the Office of Education should be inferred.

REGIONAL EDUCATION LABORATORY FOR THE CAROLINAS AND VIRGINIA
Mutual Plaza, Durham, North Carolina 27701

SELECTING AND DESIGNING METHODS AND MATERIALS

Rita Johnson

The purpose of this booklet is to provide you with step-by-step procedures for the design of a self-instructional system. It will also provide you with guidelines for the identification and selection of instructional methods and media.

> **Method/Material Selection**
>
> The selection of methods and materials should be based upon the definition of objectives, criteria, and content or task analyses.

Unless you are required by unchangeable circumstances, you should rigorously avoid any commitment to the types of method or media you will use until you have completed analysis of your objectives and criterion measures.

This is because no one best method exists for any objective. For example, APPENDIX 1 lists a broad range of instructional methods, several of which might be appropriate for any one objective.

To illustrate, in the space below, write two objectives from your unit:

1. ______________________________

2. ______________________________

Now turn to APPENDIX 1 and select three alternative methods which could help accomplish each objective. Consider only those you do not typically use and write them below:

Obj. 1: a. ____________ b. ____________ c. ____________

Obj. 2: a. ____________ b. ____________ c. ____________

If you found it easy to consider some methods of instruction which were new to you, you have already demonstrated a willingness to keep an open mind in searching for alternative methods and materials.

MATERIALS SEARCH

It is a fairly safe assumption that you will save money and time if you can find commercial or otherwise prepared materials which fit your objectives. Even if you can't find materials that apply directly, you can often borrow bits and pieces, and/or make alterations.

The first step of a materals search is to develop a set of descriptors for the subject of instruction. The ERIC (Educational Research Information Center) thesaurus is recommended as a useful tool to start your building of the descriptor list. These descriptors facilitate your combing through the countless media catalogs much like those descriptors you use in your library research.

You have probably had experience obtaining material on preview. Most commercian companies are quite willing to mail review copies or materials on approval. Rental libraries are a good source of materials which are otherwise unavailable.

When you preview materials you should work from a standardized form to assure uniform judgment. If the material appears promising, take notes, or in the case of a film or video tape--make an audio tape of the soundtrack. This will enable you to integrate the content while you are waiting for the material to be acquired.

There are three possible outcomes that may be expected of your material search. (1) You may find the right material at the right level in the right quantity. (2) You may not find enough or any appropriate materials, thus you must begin originating your own. (3) You may locate an overabundance of good material, in which case, you must produce further criteria for limiting material selection.

> The two things to remember in material selection are: (1) Let your objectives guide your material search. (Don't start with a film, textbook or some other form of media you like and then justify its use.) (2) Make your search as broad as possible.

Hopefully you have already selected two or three methods and have located several material packages to accomplish your objectives. The major reason for the selection of these methods and materials should be that they are most effective for accomplishing the objective.

The final selection must consider some practical considerations. These would include not only costs, but also the time allowed to gain the objective, the number of students who will take the unit, the available classrooms and the instructional machinery.

> Can you recall the major reason for selection of methods and materials, as well as three practical considerations? Write them below:
>
> Major Reason:
>
> 1. ______________________________
>
> Practical Considerations:
>
> 1. ______________________________
>
> 2. ______________________________
>
> 3. ______________________________

Answers:

Major Reason:

1. They help you accomplish the objective

Practical Considerations:

1. cost
2. time available
3. student numbers
4. available classrooms
5. machinery available

PRINCIPLES OF SELECTION

The first principle in media selection is to consider the instructor as a medium of instruction.

In fact, instructors are the most expensive media in an instructional system. At least 60% of the operating budget of most school districts goes to certified salaries.

Consider the efficient and professional use of the instructor as a medium of instruction. First, he is the most flexible of all media. He can change pace, rate, even content in response to the learner's condition. Second, he is the most responsive of all media. He can feel and react uniquely to unique questions. He can build pyramids of associations. He can tie content specifically to an individual learner's interests. He can adjust content to an individual student's ability level. Note that these unique advantages of the instructor are lost when the class size is too large for two-way communication between learner and instructor.

The second principle of materials selection is to consider all of the parts which are required in order to have a self-contained unit.

By "self-contained" we mean the complete set of materials and media which by themselves are necessary and sufficient to achieve an instructional objective. As an illustration, an overhead projector and a set of transparencies are not sufficient. They support a teacher in the presentation of information. The teacher's cost must be included in describing such a unit. On the other hand, a tape and tape recorder, linked with a filmstrip and projector may be sufficient to achieve an objective and therefore would be a "self-contained unit."

> The third principle in determining media is to translate media costs into a cost per student hour for comparison purposes.

This is a necessary step in convincing budget-minded administrators and trustees of the utility of an instructional approach. APPENDIX 2 offers a model for making cost comparisons, assuming that you are faced with a choice between an overhead-instructor set versus a tape-filmstrip set.

The cost comparison in APPENDIX 2 illustrates principle one above. The unit cost of an instructor plus supporting media is almost always higher than for self-contained media because the instructor is the most expensive element in the system. However, teachers are a superior medium of instruction, if they utilize their skills property.

> The fourth principle in media selection is to purchase instructional equipment only if you have sufficient material to use the equipment twenty or more hours per week.

This principle relates to having enough operational hours at your institution to reduce the cost per hour to a low figure. The more you use a piece of equipment the more efficiently it is being used. This leads to the fifth and final principle.

The fifth principle in media selection is to purchase media in terms of the objectives of major curriculum units.

To achieve a sufficient base for the justification of equipment the aims and objectives of more than one class may have to be considered. The media applications with high initial costs such as Audio-Tutorial, Dial Access, Computer Assisted Instruction and most forms of closed-circuit television can only be justified if they are of use to the entire curriculum. But, if considered on this basis these general media approaches may be the cheapest form of media.

ORIGINATING MATERIAL

One factor which will influence your development of original materials is availability of production facilities on the campus. In general the smallest educational institution can afford the equipment to produce the following materials:

Visuals

35mm slides
35mm filmstrips
Overhead transparencies
8mm motion pictures

Sound

Audio tapes

None of the above materials requires expensive facilities. Production can be done by well-trained students or the instructional staff. The production of video tapes requires more expensive equipment and a higher level of training for the staff. But if this medium is used properly the results are well worth the effort.

This booklet will direct your design efforts towards a media system which has proven to be effective when used in an educational setting, the

Audio-Tutorial Approach. This direction should not limit your method selection since it contains all of the media forms which could be used individually in the classroom. That is, it already includes the use of an instructor in small and large group discussions, yet also provides for self-instructional audio-tutorial lessons.

The Audio-Tutorial Lesson

An audio-tutorial lesson is an audio tape combined with either a workbook, a filmstrip, a slide, or an 8mm film loop, or some combination thereof. The student takes the lesson to a study carrel where he controls the equipment. Combined with the lesson, there may be an exercise or an experiment. The audio tape controls the entire lesson, and the student is in complete control over all media sources.

CHARACTERISTICS OF AN AUDIO-TUTORIAL LESSON

1. It can integrate several forms of material such as films, slides, filmstrips, etc.
2. It is self-contained.
3. It may be stored in a form which can be used repeatedly for many years.
4. It is individualized in that the student can take the lesson at his own convenience and proceed through a series of lessons at his own pace.
5. It is only the machine element of a "man-machine" system. The necessary man portion of the system consists of instructors interacting with students in small discussion groups. The instructor makes the information meaningful to the student by associating it with his interests and needs, and by dealing with his individual learning problems.

The Audio-Tutorial lesson is under the control of the student. He may proceed at his own pace, repeating parts of the lesson as many times as necessary. He may take the lesson any time the laboratory is open. The audio-tutorial lesson is especially useful when comparing, analyzing, problem-solving, or drilling is required. On the other hand, the instructor is now free to meet with individuals, small groups and large assemblies in order to tutor, clarify, amplify, evaluate, and encourage or inspire.

Let us eummarize your progress ot this point. You are now developing and creating a self-instructional unit which will need to be tested shortly with a few students. You may wish to direct your efforts toward developing a tape-controlled system, such as the audio-tutorial. Instead you may wish to develop a series of self-instructional activities, *none* of which would be controlled by audio-tape. Either system should not restruct your selection of methods or materials in any fashion. In fact it should increase the possible alternatives.

PREPARING AN AUDIO-TUTORIAL OR SELF-INSTRUCTIONAL LESSON

Step I: From your unit of instruction, select a large segment of content or lecture material which is clearly related to one objective and write a *sequential script*. Be certain to utilize a few instructional variables which might improve learning (e.g., advance organizers, perceived purpose statements, elicitors, prompts, appropriate practice, small learning steps, knowledge of results).

Step II: Write down on one half of the sheet of paper what you say and on the other half what you would write on the blackboard.

Narration	*Blackboard*
"You usually *tell* the students more than you *show* them on the blackboard."	Tell Show
"You *show* them what you want to *reinforce*."	Tell Show Reinforce

Step III: Analyze what you have said in the lesson for potential visualization.

(a) First look at your nouns and adjectives. Are you describing something which you could visualize by picture, a graph, or an outline?

(b) Examine your verbs and adverbs. Are you describing an action, an activity or a motion which could be shown rather than explained? This examination for implied motion should be done carefully. For instance, when you describe causality you are describing motion. When you describe associations on multiple levels, you are describing motion. When you discuss dimensions, you can often explain a fourth dimension by the use of motion. The introduction of motion into a lesson generally has positive influence on the student's receptivity.

Narration	Visual
"You could tape your lecture and photograph what is shown on the blackboard."	Slide: Instructor writing at blackboard while speaking into a microphone connected to a tape recorder.

(c) Circle all nouns and verbs in your script which can be visualized.

(d) Indicate the form and content of the visualization as in the example.

(e) Change your narration to reflect and support your visualization.

Step IV: Examine your script for possibilities of student activity or experimentation. Remember in the Audio-Tutorial lab the student will not be tied to the chair. He or she can get up to examine displays, operate a piece of machinery, or take some other action which will result in discovery and understanding. These activities should be implied in your post test. The student will generally learn more if he has an opportunity to actively practice what he is to learn.

Narration	Action
"At the sound of the chime you will stop the tape and circle the nouns and verbs in your script which can be visualized. When you are through turn the tape on." -Chime-	Students will stop the tape. Students will circle nouns and verbs to be visualized. Students will turn the tape back on.

Step V: Now that you have visualized and activated your script, examine once again the places you might utilize instructional variables to increase learning effectiveness (i.e., Are your learning steps small enough? Do you need to add prompts? Are students finding out if they responded correctly?)

Step VI: Now examine the remaining element, the sound. The first consideration is the narration; in person or on tape, you can do it yourself or engage someone with a trained voice.

Another consideration is supplementary sound. Are you referring to an object which has a natural sound that could be heard on the tape? Can you use more than one voice, a guest speaker or a dramatic dialogue? Would excerpts of music or choral reading further your objectives?

Examine your script and indicate in the margin any sound possibilities.

Step VII: After you have reworked your script to reflect appropriate activities, the visuals, and the supplementary sound elements, it is time to start assembling materials. Note that your visuals fall into three broad classes;

(a) Graphic Material: (Similar to what you write on the blackboard.) The preparation of these materials should be done carefully since you are creating a permanent record. Use color whenever possible to reinforce learning points. The use of professional lettering equipment or a graphic artist is desirable but not necessary. A careful freehand will probably be clearer to the students than your normal writing on the blackboard. These graphic visuals can be photographed into filmstrips.

(b) Photographs of Actual Objects

Here again it is best to start with slides which will later be copied onto a filmstrip. With modern camera equipment it is quite easy to make either slides or filmstrips. You may have had experience in the use of a slide camera for family photographs. If you don't have technical assistance, don't be afraid to do your own photography.

(c) Motion Pictures

It is also possible to consider two classes of motion picture visuals. The graphic visuals are animated sequences such as found in cartoons. The technique can be very effective in explaining subject matter, but is more difficult to use than live action. Live action is easily photographed in 8mm. Again you may be familiar with the equipment and techniques through your family photographing experience.

Step VIII: Assemble your visual materials into a set of slides and/or a 8mm motion picture film. Now select a student from your target population. Try to choose a slow learner since he will teach you the most about your writing ability. Talk the student through the lesson, allowing him to ask questions freely. Make a tape of your narration, and the questions the student asks so you can study it for later revision. If you have made extensive changes, select another student and repeat the process. Repeat the process as often as necessary to the point where you do not have to make explanations supplementary to the script. Your multi-media package is now already for empirical testing. However, if you are preparing a lesson which is to be audio-tutorial you must complete the final step.

Step IX: Assembly the final Audio-Tutorial lesson. Prepare a filmstrip from the augmented slide set and tape narration.

There are two ways to tape the final narration. The professional way is for you to record from a sound booth while observing a student who is listening and working through the lesson. This will give you cues for proper pacing.

The other way is slightly less effective, but much simpler. Borrow a good tape recorder, and make the recording in a quiet room. The problem with the latter technique is that you must make a conscious effort to avoid sounding pedantic. It is difficult to keep a natural tone in your voice when speaking to a microphone. Recall that you are talking to an individual student and not a class!

The purpose of this booklet was to help you select and originate a broad-ranged methods/materials system. If the author is successful, 90% of the readers will attain a score of 80% or more on these true-false items:

______ 1. The Audio-Tutorial system is the only system that individualizes instruction and integrates a variety of media.

______ 2. For each type of objective there is probably one best method.

______ 3. Finding commercial materials which fit existing objectives will save you money and time.

______ 4. One way to insure uniform judgment of materials to be selected is to work from a standardized form.

______ 5. Cost, time, size of class, and available machinery are considered to be practical considerations in selecting media.

______ 6. An instructor should search for a film he knows and likes even if it does not fit his objective.

______ 7. The cost of the teacher must be included in describing a multi-media unit.

______ 8. The most flexible and responsive medium of instruction is the instructor.

______ 9. The student controls the pace of an audio-tutorial lesson.

______ 10. The complete Audio-Tutorial System includes use of instructors interacting with students in small and large discussion groups.

NOTE: PLEASE RETURN REVISION DATA SHEET -- LAST PAGE

The answers to this test follow and can be verified by rereading the booklet:

1. F
2. F
3. T
4. T
5. T
6. F
7. T
8. T
9. T
10. T

As a further activity, carefully do the following:

1. Select one or two objectives from your unit.
2. Produce a sequential script (including visualization, activation and sound) which is designed to accomplish the objectives selected above.
3. Provide for small steps, prompting, practice and knowledge of results within the script.
4. Prepare to empirically test your system on from 1-4 learners who will be able to help you refine the system before its final implementation with the total learner group.

APPENDIX 1

METHODS OF INSTRUCTION

The principal methods by which instruction is provided:

Comparative Analysis - A thought process, structured by the teacher, employing the description, classification, and analysis of more than one system, group, or the like so as to ascertain and evaluate similarities and differences.

Demonstration - An activity in which the teacher or another person uses examples, experiments, and/or other actual performance in order to illustrate a principle or show others how to do something.

Diagnosis - The continuous determination of the nature of learning difficulties and deficiencies, used in teaching as a basis for the selection - day-by-day or moment-by-moment - of appropriate content and methods of instruction.

Directed Observation - Guided observation provided for the purpose of improving the study, understanding, and evaluation of that which is observed.

Discussion - An activity in which pupils, under teacher and/or pupil direction, exchange points of view concerning a topic, question, or problem in order to arrive at a decision or conclusion.

Drill - An orderly, repetitive learning activity intended to help develop or fix a specific skill or aspect of knowledge.

Experimentation - An activity involving a planned procedure accompanied by control of conditions and/or controlled variation of conditions together with observation of results for the purpose of discovering relationships and evaluating the reasonableness of a specific hypothesis.

Field Experience - Educational work experience, sometimes fully paid, acquired by pupils in a practical service situation.

Field Trip - An educational trip to one or more places where pupils may study the content of instruction directly in its functional setting, e.g., a trip to a factory, newspaper office, or fire department.

Group Work - A process in which members of the class, working cooperatively rather than individually, formulate and work toward common objectives under the guidance of one or more leaders.

Laboratory Experience - Learning activities carried on by pupils in laboratory designed for individual or group study of a particular subject-matter area, involving the practical application of theory through observation, experimentation, and research, or, in the case of foreign language instruction, involving learning through demonstration, drill, and practice. This applies also to the study or art and music, though such activity, in this instance, may be referred to as a studio experience.

Lecture - An activity in which the teacher gives an oral presentation of facts or principles, the class frequently being responsible for note taking. This activity usually involves little or no pupil participation by questioning or discussion.

Manipulative and Tactile Activity - Activity by which pupils utilize the movement of various muscles and the sense of touch in order to develop manipulative and/or perceptual skills.

Modeling and Imitation - An activity, frequently used for instruction in speech, in which the pupils listen to and observe a model as a basis upon which to practice and improve their performance.

Skill Practice Session - All activity in which pupils have opportunity to put into practice those skills and understandings previously learned through other instructional activities.

Problem-Solving - A thought process structures by the teacher and employed by the pupils for clearly defining a problem, forming hypothetical solutions, and possibly testing the hypothesis.

Programed Instruction - Instruction utilizing a workbook, or mechanical and/or electronic device which has been "programmed" to help pupils attain a specified level of performance by (a) providing instruction in small steps, (b) asking one or more questions about each step in the instruction and providing instant knowledge of whether each answer is right or wrong, and (c) enabling pupils to progress at their own pace.

Project - A significant, practical unit of activity having educational value, aimed at one or more definite goals of understanding, and involving the investigation and solution of problems.

Reading - Gathering information from books, periodicals, encyclopedias, and other printed sources of information, including oral reading and silent reading by individuals.

Recitation - Activities devoted to reporting to a class or other group about information acquired through individual study or group work.

Role-Play - An activity in which students and/or teacher take on the behavior of a hypothetical or real personality in order to solve a problem and gain insight into a situation.

Seminar - An activity in which a group of pupils, engaged in research or advanced study, meets under the general direction of one or more staff members for a discussion of problems of mutual interest.

Sensitivity Training - An activity in which a group and a trainer meet to self-consciously examine their immediate feelings and perceptions about themselves and each other, in order to gain skill in authentic communication, leadership, behavioral flexibility or social sensitivity.

Shopwork - An activity emphasizing skill development through experience in woodwork, metal work, or other industrial processes and procedures.

APPENDIX 2

PART 1

MODEL FOR MEDIA SET COST COMPARISON

1. Equipment Costs	Instructor Overhead	Tape Filmstrip
1. Initial Cost of equip.	$150.00	$300.00
2. Amortized for 6,000 hours of operation. (30 hrs./wk x 40 wks/yr x 5 yrs = 6,000 hrs.) per hour	.025	.050
3. Maintenance/hour	.010	.020
2. Material Cost		
a. Visuals - 30 frames @ .30 frame @	9.00	
30 frame filmstrip		1.50
b. Narration cost tape		1.50
c. 20% of lesson is revised each x 5 yrs.	9.00	3.00
d. Total cost material for 5 years	18.00	6.00
e. ---6,000 hrs.	.003	.001
Media Costs	Instructor Overhead	Tape Filmstrip
3. Total material and equip. cost per hour	.038	.071
4. Instructor time per hr.	6.00	---
5. Total cost per hour	6.038	.071
6. Per student hour @ 30 students/hour	.201	
@ 1 student/hour		.071

EXPLANATION ON NEXT PAGE

APPENDIX 2

PART 2

EXPLANATION

1. The first step is to compute the cost per hour of the equipment. This requires you to estimate the useful life of the equipment in terms of hours of operation. We estimated that all of the equipment we are comparing would last five years or for 6,000 hours of operation. We also estimated that repairs and maintenance for each piece of equipment would cost \$.01 per unit per hour.

2. The second step is to compute the cost of the material. We are not counting the preparation time since we assume that would be the same for both types of material. We assume that there are thirty visual frames in the lesson, that overhead transparencies cost \$.30 per frame and that a thirty-frame filmstrip costs \$1.50. The instructor will supply the narration that accompanies the transparencies but a tape costing \$1.50 is required for the tape-filmstrip set.

   For purposes of comparison we assume that the basic material sets will be good for five years. To be safe we assume that 20% of the set will be revised each year. At the end of five years the material will have undergone a 100% revision cycle. This total cost can be divided by the 6,000 hour base period, for a per hour cost.

3. The per hour costs of the equipment and the material is added.

4. The instructor's time must be added to the overhead costs to make it a self-contained set. This cost cannot be amortized since

the instructor must be present every time the lesson is given. The tape and filmstrip are a self-contained set; the instructor's presence is not required.

5. The total set cost per hour is the total of the equipment, material and instructional costs per hour.

6. The final step is to divide the total number of students who will benefit from the lesson at one time by the total cost per hour which gives the cost per student hour. We assume that the instructor-overhead lesson is given to thirty students at a time. The filmstrip tape lesson is given to only one student at a time.

Note that the initial cost of equipment in a tape-filmstrip set is twice that of the overhead. However, the actual unit cost is approximately one-third since the instructor must be added to the cost of the overhead.

REVISION DATA SHEET - BOOKLET IV

PLEASE COMPLETE THIS SHEET AND MAIL TO:

The Johnsons
Regional Education Laboratory
for the Carolinas and Virginia
Mutual Plaza
Durham, North Carolina 27701

INSTRUCTIONS: Please mark those answers which you "missed" and comment on your reasoning, sources of confusion, etc.

Practice Exercises:

Page

3. ______ 1.

______ 1.

______ 2.

______ 3.

Criterion Test:

Page

12. ______ 1.

______ 2.

______ 3.

______ 4.

______ 5.

______ 6.

______ 7.

______ 8.

______ 9.

______ 10.

______________	______________	______________	______________
NAME	TEACHING AREA	SCHOOL	DATE

BOOKLET V

REFINING THE INSTRUCTIONAL SYSTEM

Rita Johnson

RELCV Working Paper

RELCV, a private non-profit corporation, is a regional education laboratory funded primarily by the United States Office of Education under provisions of Title IV of the Elementary and Secondary Education Act of 1965. The opinions expressed in this paper do not necessarily reflect the position or policy of the Office of Education, and no official endorsement by the Office of Education should be inferred.

REGIONAL EDUCATION LABORATORY FOR THE CAROLINAS AND VIRGINIA
Mutual Plaza, Durham, North Carolina 27701

REFINING THE INSTRUCTIONAL SYSTEM

Rita Johnson

This booklet presents a procedure for the empirical testing and the revision of an instructional unit, component, product or program. It deals with the need to successively refine the initial draft of a proposed unit of instruction.

Lesson plans, units, courses of study, or any reproducible sequence of instruction designed to produce observable changes in learner behavior must undergo empirical test and modification. Successive try outs and revision prior to actual instruction significantly heighten the probability of success when instruction is implemented.

The instructor who seeks to attain his objectives will want to test the material out on small sets of learners (2 to 5 students) prior to its full-scale implementation. He will examine learner responses carefully and make appropriate modifications in the material to increase the likelihood of learner achievement. He will then try the modified material with a new set of learners and make further refinements until a specified level of performance is achieved by all learners.

Careful attention to this booklet will result in your being able to:

- list three categories of problems likely to be found in instructional material during an empirical try out
- cite examples of specific instructional improvements which can be made in light of learner responses received during an empirical try out
- describe five procedures for obtaining learner responses during an empirical try out so as to eliminate superfluous or confusing characteristics of the instructional material.

* * * * * * * * * * * * * * * * * * * *

COMMON PROBLEM AREAS

In the early stages of developmental testing, an instructor can actually study the individual learner as he learns. Obtaining feedback from the student, of course, is not new. Even when lecturing, an instructor may ask for questions, leading to further examples, restatements, and so forth. This process may lead to a complete revision of the original lecture.

What is relatively new, however, is the notion of closely observing an individual learner working in the early stages of a program design. Rather than taking lengthy chunks of finished material into the classroom, the instructor should test small parts of his unfinished design with a single learner. Ideally the feedback from learner to instructor begins early, proceeds work by word, element by element, and ceases only when the instructional researcher has achieved his goal--an effective teaching tool.

What is vital here is the notion that the learner is going to teach you. The learner cannot fail, for if he does not get where you want him to go, your material has failed. You must therefore try something else. In fact, in the absence of anything better it might be best to trust your intuition and vary your approach until you are successful. Then edit the material and try it on another learner. Make whatever changes are necessary for your material to take care of both students. After three or four tries, each with a different learner or set of learners, you will have instruction that is more likely to accomplish its objective than before.

Many writers on this subject insist that the first draft should fail to achieve the predicted goal if it is to make full use of data from the learner being tested. If the instruction works completely on the first trial, the learner has been deprived of an important opportunity to contribute to the design of your instruction. Typically, the first draft will elicit learner responses of a 70% accurate nature with approximately 70% of the try out learners.

During your trial runs you may find problems being uncovered which fall into three fairly distinct categories:

- Clarity: a need for rewording or rearrangement of material to improve the sentence structure, vocabulary, explanation, instruction or question.
- Attending: a need to heighten interest to gain attention, arouse curiosity, provide a challenge, and thereby lessen distraction, boredom, or apathy.
- Instructional-variables: a need to alter the presentation to improve the pace, sequence, organization, size of learning step, use of prompts, opportunities for practice, or reinforcement.

* * * * * * * * * * * * * * * * * * * *

Three categories or problems have been cited which are likely to be uncovered while empirically testing your instruction. What are these three categories? If you wish, go back and reread the three definitions.

* * * * * * * * * * * * * * * * * * * *

Below, write what you consider to be an example of a specific revision you might make to solve a problem in each category:

- Clarity: ____

____

- Attending: ____

____

- Instructional-Variables: ____

____

Examples of ways to improve clarity might be to reword the instruction, add a clarifying example, simplify an explanation, change the vocabulary, shorten the sentence or add a definition.

Problems in attending might be lessened by adding some humor, eliminating a distraction, providing a sense of purpose of importance, adding an arousing or attention-getting segment.

Instructional-variables may be improved by providing more practice activities, adding cues or prompts, rewarding the learner more frequently, shortening or lengthening the number of steps in an activity, slowing up the pace, or reorganizing the sequence of activities.

Below are over a dozen modifications you might make when you try out and revise your own instructional program. Indicate with letters which ones you believe to be directed toward solving problems of clarity ("C"), attending ("A"), or instructional-variables ("I").

1. make instructions clearer ________________
2. attract the student's attention ________________
3. reword the question ________________
4. change the vocabulary ________________
5. shorten the number of steps in an a activity ________________
6. simplify the explanation ________________
7. give a clarifying example ________________
8. speed up the pace ________________
9. add some humor ________________
10. add some extra prompts ________________
11. add a practice exercise ________________
12. provide a sense of purpose and importance to the activity ________________
13. reward the learner after the activity ________________
14. rearrange the sequence of activities ________________

* * * * * * * * * * * * * * * * * *

Answers:

1. C
2. A
3. C
4. C
5. I
6. C
7. C
8. I
9. A
10. I
11. I
12. A
13. I
14. I

* * * * * * * * * * * * * * * * * *

MULTIPLE PROCEDURES FOR OBTAINING LEARNER RESPONSES

Instructional technologists have developed a variety of procedures for obtaining learner responses to each element in instructional material to eliminate superfluous or confusing portions. A combination of these approaches plus others should be employed.

Regardless of which combination of procedures is used, the instructor should adopt a tutor-like approach with his learners and employ a tape recorder to record the empirical test. In this way, later distortions due to memory loss or selective perception are likely to be lessened.

During the try out, at least five different methods for obtaining learner responses might be tried:

(1) Error-rate approach: the basic concept here is to collect responses to each item, question, or element in the process, and then analyze and modify those items which produce error or do not result in the desired learner response.

By locating such errors, the instructor is provided with clues as to where appropriate modifications of the material are needed. For example, if the student responds with, "I cannot answer that question," the instructor may decide that there is need for some additional prompts and practice exercises, or simply that the question is poorly worded.

(2) Interview technique: this technique consists of asking for reactions or comments during or following a lesson. The instructor may not necessarily want to lead the learner and invite opinions as to how a specific element might be revised. Yet, when the learner does make an error, the instructor uses that error as information together with

candid comments the learner might make to modify the materials being developed.

For example, the learner might add, "I guess I wasn't paying much attention," in which case the instructor may decide the problem was one of lack of interest. This might lead to the inclusion of material designed to arouse curiosity or challenge the learner.

(3) Diagnostic - criterion test approach: this technique utilizes a diagnostic test, in addition to the regular criterion test, in an attempt to determine the degree of attainment of all prerequisite tasks or behaviors assumed to be needed prior to accomplishing the criterion test. Diagnostic errors suggest which specific sections of a program need to be deleted, expanded or reworked.

For example, in developing a mathematics program, the instructor may wish to find out which elements of the program need expansion and more thorough treatment. Analysis of the errors on a diagnostic test will tell him which tasks or concepts need to be taught more carefully before he can expect overall mastery of the objectives.

(4) Latency of response approach: this technique is based on studies which indicate that delay in responding to items is an effective means for identifying item deficiency. Latency of response (even when the correct response is eventually given) tells the educator when the learner is experiencing difficulty and when parts of the material need to be revised to make more of a contribution to the outcome performance.

If, for example, a learner indicates he wants to "think about it for awhile" the instructor has a clue as to where a modification of the material is needed. The student may be confused, the material presented may be ambiguous or the material may be too difficult.

(5) Black-out rate procedure: this is a method proposed for eliminating extraneous parts within a lesson. It simply requires deleting or covering over (with paper, black crayon, or ink) all learner activities or expository material which you believe might not be essential in producing a desired response. In this manner the instructor has a useful guide to determine how much might be deleted without increasing errors.

Therefore, if you have a hunch that certain material or activities are superfluous, you might try deleting it to see whether it makes a difference. It has been demonstrated that over 50 percent of existing material may be blacked out and errors are not significantly increased. This means you might delete half of your instruction and cut your teaching time in half, without decreasing any learning!

Thus far, five approaches for obtaining learner responses have been discussed. These are: 1) error-rate, 2) interview, 3) diagnostic test, 4) latency of response, and 5) black-out. Which procedure do you think is being used in each instance below? Write the procedure next to each of the examples.

a. The learner spontaneously says, "I don't like this." ______________

b. Instructor asks for additional comments about any aspect of the lesson. ______________

c. An instructor of English composition gives a vocabulary test. ______________

d. Several learners respond that they're "thinking it over." ______________

e. The instructor elects to omit the first half of his lesson. ______________

f. Instructor notes that three learners didn't follow a specific instruction. ____________

g. Instructor decided not to tell his favorite joke. ____________

h. Learners complain that an assignment was dull. ____________

i. Instructor notes that when she asks a question no learner responds immediately. ____________

j. Of 10 learner responses given in a lesson, four are judged as inappropriate. ____________

* * * * * * * * * * * * * * * * * * *

The answers are:

a. Interview
b. Interview
c. Diagnostic Test
d. Latency of Response
e. Black-Out
f. Error-Rate
g. Black-Out
h. Interview
i. Latency of Response
j. Error-Rate

* * * * * * * * * * * * * * * * * * *

CONCLUSION

The purpose of this booklet was to provide you with some procedures for improving the initial design of instructional material and activities. Empirical testing of your proposed program in the form of several try out and revision cycles was suggested to help you refine and upgrade the effectiveness of your material.

It is apparent, of course, that such developmental testing can be costly and time-consuming. In fact it would be difficult to empirically try out every lesson, activity or component prior to its implementation. The saving in learner time on an empirically tested unit of instruction, however, may more than repay the investment of time and energy spent on testing and revising that unit.

The tester does more than observe, make a tape-recording, and take notes. He must be sensitive to overt expressions of thinking on the part of the students. He must notice gaps, predict confusions, sense response failures, rewrite new items on the spot and elicit honest responses. He must let the learner teach him without being defensive. This humility and responsiveness to criticism comes hard to many instructors. Such a person must be able to learn from the mistakes of one learner, capitalize upon them when faced with a new learner, and consistently improve upon the material's effectiveness.

Since only a few learners are being tested at this early stage, they are not a very representative sample of those in the actual instructional setting. Can one really learn much by observing only one learner? Amazingly, one is much better than none! You probably will find that observation of even one learner can significantly improve your first draft of a program. Hopefully, you will have an opportunity to make three or four empirical try outs and revisions and each cycle of modification should move you toward your goal of some level of mastery attained by all learners being tested.

* * * * * * * * * * * * * * * * * * *

If the author of this booklet has been successful, 90% of the readers should now be able to take the following criterion test and attain a perfect score.

1. Below are five procedures for eliminating superfluous or confusing elements in instructional material. Write the letter of the statement that best describes each procedure:

☐ Error-Rate:

☐ Diagnostic-Criterion Test:

☐ Latency of Response:

☐ Interview Approach:

☐ Black-Out Approach:

A. Deleting superfluous material to see if needed.

B. Determining length of time taken before learner responds.

C. Obtaining spontaneous, candid comments from learner.

D. Determining where mistakes are being made most frequently.

E. Determining if student has mastery over certain skills.

2. Three general categories of problems are likely to be uncovered during an empirical tryout of instructional material. Give two examples of each.

   a. Clarity: ____

   ____

   b. Attending: ____

   ____

   c. Instructional-Variables: ____________________________

   ____

3. List six examples of material revisions which might be made in your instructional material after an empirical test.

a. ____

b. ____

c. ____

d. ____

e. ____

f. ____

Answers:

1.
    1. Error-Rate: D
    2. Diagnostic-Criterion Test: E
    3. Latency of Response: B
    4. Interview Approach: C
    5. Black-Out Approach: A
2. See Pages 4 and 5.
3. See Pages 4, 5 and 6.

For an important additional activity, you might consider carrying out out the following steps:

1. Try out your program on from one to four learners. In light of learner response, make necessary modifications in your draft.
2. Try out the revised program on another small set of learners and make necessary revisions.
3. Try out your refined program on a third set of learners and refine once again.

Finally, it would be worth your time to go back and examine the combination of methods you used and the problems that emerged during each empirical test. Did you try to improve clarity, attending, or instructional-variables? What revisions did you make? Are you moving toward your original system goal of a specific level of learner mastery over the instructional material?

* * * * * * * * * * * * * * * * * * * *

PLEASE RETURN REVISION DATA SHEET--LAST PAGE

REVISION DATA SHEET - BOOKLET V

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INSTRUCTIONS: Please mark those answers which you "missed" and comment on your reasoning, sources of confusion, etc.

Practice Exercises:

Page

5. ______ Clarity
______ Att.
______ I-V
6. ______ 1.
______ 2.
______ 3.
______ 4.
______ 5.
______ 6.
______ 7.
______ 8.
______ 9.
______ 10.
______ 11.
______ 12.
______ 13.
______ 14.
10. ______ a.
______ b.
______ c.
______ d.
______ e.
11. ______ f.
______ g.
______ h.
______ i.
______ j.

Criterion Test:

Page

15. ______ER
______DCT
______LR
______IA
______BOA
______Clarity
______Att.
______I-V
16. ______ No. of examples missed

______ NAME
______ TEACHING AREA
______ SCHOOL
______ DATE